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The management and effectiveness of professional and clinical networks

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Glossary of terms/abbreviations

Artefact: a product or output of a network. This product may be tangible (e.g. a new building) or intangible (e.g. a decision, a plan; which are documented but have no other physical existence). This is a wider use of 'artefact' than in everyday speech.

Attenuation factor: Some members in some networks are only linked indirectly, through a number of intermediaries. The greater the number of intermediate links, the less influence the two people or organisations at the ends of the chain of links can be expected to have on each other. An attenuation factor states the percentage by which this influence decreases with each successive link. (It is more often stated as an assumption than calculated from data.)

Betweenness centrality: the extent to which an organisation (or person) is a link on the paths of links connecting other organisations (or people).

Bonacich power score: A measure of the extent to which each organisation (or person) is connected to others who are not highly-connected, so that these others depend on the first organisation (or person) for links to the rest of the network.

Brokerage: When one organisation (or person) acts as an intermediary between two (or more) others, creating relationships between the other two that would not otherwise occur. This property is measured by a brokerage score. The higher its brokerage score, the more the organisation fills the role of broker (intermediary) between other network members.

Care network: A network whose goal is to operate complex referral paths, so that patients who require care from multiple organisations receive all the care they need and in a co-ordinated fashion. Also known as referral networks, these networks focus on day-to-day operation of an existing care pathway or model of care.

Centrality: Extent to which a person or organisation is central to the network, in contrast to being a marginal 'isolate' or a 'pendant' (see below).

Connectedness: The existence of stable, repeatedly-used links between organisations (or people).

Culture: The explicit values, tacit norms and artefacts (see above) of an organisation or network.

Degree: The number of links that a network member has to other network members.

Degree centrality: The centrality of an organisation or person measured in terms of the number of links it (or he or she) to others in the network.

Density: A network in which every member had direct links to every other member would have a density of 100%. In practice most networks are less dense. Their density is measured as the percentage of the theoretical maximum number of links (everyone directly linked to everyone).

Enclave: A network with an exclusive membership. Some writers (but not the present report) also define enclaves as being non-hierarchical.

Experience network: A network of service users, carers or groups of them aiming to influence the availability or quality of care.

Flow centrality: A measure of the extent to which each network member is on the shortest set of links between the other network members.

Freeman Centrality: A measure of centrality which expresses how closely a given organisation or person comes to being the hub in a 'hub-and-spoke' structure.

Flow (betweenness) centrality: A measure of the extent to which each network member is on the shortest set of links between the other network members.

Hierarchical reduction: Analysis of the extent to which a network has the same structure as a hierarchy i.e. with one 'top' member and links branching outwards (or 'downwards'), eventually reaching members who have no further links. This last stratum of members are 'pendants' (see below).

Innovation-related activity: Activities which are not innovations in themselves, but are intended to or are likely to generate innovations (i.e. the introduction of new working practices from outside an organisation or network) or inventions (new working practices created for the first time).

Isolate: Person or organisation who is nominally a network member but in practice has no links to any other member.

Krackhardt GTD (graph-theoretical dimensions): A set of four measures which in combination measure how far a network has the structure of a hierarchy (see above).

Node: A single network member (organisation or person).

Normalised: A measure or score which is calculated or formulated in such a way as to make it comparable across networks.

Pendant: A network member who is linked to only one other network member.

Programme network: A network whose goal is to implement a new model of care (new care technology, new standards, new care pathways, new way of organising care delivery).

Project network: A network whose goal is to complete the installation of a new piece of infrastructure (e.g. building, IT system).

Reach centrality: A measure of centrality expressing what proportion of the other network members a given network member is directly linked to (rather than linked to via intermediaries).

Separation: The extent to which groups of links within a network are separate, i.e. linked at only one point (as in, say, a hub-and-spoke structure).

Symmetrisation: A link between person A and person B might be directional (e.g. A sends messages to B). Such a link may or may not be reciprocated (e.g. if B never sends messages to A). A set of data about network links is symmetrised by applying the assumption that if A is linked to B, then B must be linked to A. This method enables gaps in network maps to be filled, but at the price of losing information about which links are reciprocated and which are not.

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Executive summary

Background

Networks have increasingly been adopted as a managerial and policy solution for co-ordinating health services 'horizontally' across primary, secondary and tertiary care, across health and social care and for 'new public health' purposes. The GP Commissioning Consortia announced in Equity and Excellence: Liberating the NHS will also be networks of general practices and related organisations. Policy-makers and managers therefore have reason to be interested in discovering what forms of network structure, what network managerial practices and what other conditions are most likely to enable a network to realise the policy objectives which policy-makers and health managers have given it; that is, what factors promote the 'effectiveness' of professional and clinical networks.

Aims

We aimed to answer the following research questions.

1. How do networks emerge as rational co-ordination structures? What determines the formation of both mandated and non-mandated networks?
2. In mandated networks, what prior social networks pre-exist and how do they affect the operation of the new, mandated network? Does re-organising network structure disrupt or enhance network processes, or not affect them at all? How does the inclusion of additional occupational groups and other network members (e.g. users) affect performance?
3. What determines the way in which member organisations use relational co-ordination structures (or fail to)? What determines the effectiveness of member organisations' use of these structures?
4. What types of co-ordination processes mediate the above effects?
5. How do the different layers of network, dealing with different media or contents, co-exist and influence each other?
6. How are member organisations within a network tied to organisations outside it, how are these relationships structured, and what effect do these relationships have on how effectively member organisations use relational co-ordinating structures?

7. What effects are produced by incentives to cooperate (or not to)? What match is there between incentives and network structures? In NHS networks for example, how will the shifts to practice-based commissioning and payment by results affect network processes?
8. What determines the performance of mandated and non-mandated network structures, and are there systematic differences in the performance of the two kinds?

Methods

We compared seven health networks. Three were concerned with cardiac heart disease and three with health services for children with long-term health problems. The seventh network was set up by people with current or recent mental health problems to engage in physical self-care. Of these networks, two were 'care networks' mainly operating existing care pathways. Three were 'programme networks' focused mainly on re-configuring referral patterns, care pathways and clinical practice. One was a 'project network' managing a large-scale re-profiling of children's services in a large city. The seventh non-NHS 'experience' network focused on self-care. The latter and one of the NHS networks were voluntary, the rest mandated. We compared the networks using:

1. Social network analysis, mapping and measuring the structure of links within each network; and comparing networks in those terms.
2. Systematic comparison of case studies of each network and the outputs ('artefacts') they produced.

Results

The following findings are numbered to match the research questions.

1. We observed two modes of network creation. Voluntary networks emerged 'from below' as groupings of individuals and organisations interested in performing common tasks, which might include producing relatively intangible artefacts such as information or guidance, or more tangible tasks such as changing service provision. Mandated networks were created 'from above' by NHS management, typically by taking control of pre-existing emergent networks and then, in some cases, re-structuring them.
2. In mandated networks the membership tended to include a higher proportion of managers, network objectives became focused on national guidance, and network activities altered correspondingly. Re-organisation of networks' member organisations (especially PCTs)

was disruptive, sometimes severely and for a considerable period. Inclusion of users in the NHS networks did not have much effect on network activity but in the non-NHS experience network users played a decisive role because they controlled the network and provided its core activities.

3. Members' engagement with networks partly depended upon whether participation in the network appeared to help them meeting targets, mandates and incentives generated outside the network (for organisations) or in terms of their personal interests and opinions (for individuals). Member organisations used the networks we studied mainly by linking to each other directly, not just via the network's co-ordinating body. We found no evidence that network connectedness stimulated innovation-related activity. The most highly connected organisations were not necessarily those with the internal organisational culture most favourable to inter-professional collaboration.

4. For co-ordination the networks had a central steering group (or equivalent) with specialist sub-groups for particular tasks. Although the organisations which hosted the networks were well-connected to most other organisations in the networks studied, they were not uniquely well-connected. To a large extent network co-ordination occurred through direct links between network members in pursuit of specific tasks. Links between members were generally direct, dense (extensively connected) and deep (i.e. on multiple levels). Network co-ordination was non-hierarchical. Knowledge management, in the form of evidence-basing of clinical and care practice, became an important means of co-ordination, the more medicalised the networks were.

5. The network layer(s) carrying out the core activity of the network tended to be the most dense. Network links mediated by money were never more dense than other layers of links, and usually much less dense. Financial incentives played little part within the networks.

6. Member organisations had relatively few and weak links to bodies outside the network. Member organisations' links to other organisations within the networks were more numerous and stronger. Links outside the networks tended to be with multi-disciplinary bodies rather than with (uni-)professional networks.

7. The main incentives for network members to cooperate were the expectation of practical help-in-kind and the legitimacy of evidence-based practice. Network co-ordinators were able to 'harness' more powerful targets and incentives (e.g. Payment by Results) originating

outside the networks. Practice-based commissioning had little effect on the study networks.

8. Voluntary and mandated networks differed in the balance between national and local objectives; composition of membership (more managers in mandated networks); and ability to 'harness' incentives external to the networks. Network artefacts were predominantly intangibles (guidance, policies etc.) but some tangible service changes were also produced, especially by the user-controlled 'experience' network. There was some evidence that the more highly-connected organisations showed a greater reduction in referrals susceptible to primary-secondary care co-ordination.

Generalisation from the networks we studied to others requires caution in view of the small numbers of study networks. Routine service outcome data could be matched to SNA data only for three networks. Nevertheless our study networks do appear qualitatively fairly typical of their kinds.

The distinctive theoretical contribution of this study is to analyse health networks as being processes of production. Its distinctive empirical contributions are evidence of what outputs the networks contributed to their local health economies; and evidence suggesting that the organisations most closely connected with the networks' core process of production were also the organisations responsible for the lowest growth in hospital admissions preventable by primary-secondary care co-ordination.

Conclusions

1. Network managers have to nurture and develop network identity, make it explicit and involve the less-connected members so as to increase the connectedness and therefore effectiveness of the network. This requires skills of relationship-maintenance, diplomacy, consultation and negotiation.
2. Networks can function effectively without all their links and activity being mediated by the co-ordinating body. For many purposes it is important to establish and conserve direct links between network members, not just links to the co-ordinating body.
3. It is necessary that the member organisations select representatives with sufficient status and power within their 'home' organisation to implement network decisions.
4. Engaging potential members becomes easier if the network can 'harness' the existing incentives which these members already face outside the network.

5. Mandated networks are liable to make little use of other (external) networks or resources. Network co-ordinators should encourage network members, and the network collectively, to exploit external linkages.
6. Frequent health system re-structuring is detrimental to networks but seemingly a fact of NHS life. Maintaining stable membership and roles helps networks continue functioning during these periods.
7. Because network co-ordination depends heavily on relationality (which takes time and continuity to develop) and shared activity it would be prudent wherever possible to base GP commissioning consortia on PBC consortia and other existing GP networks.
8. The experience of earlier networks suggest that GP commissioning consortia may be liable to become somewhat closed to outside resources of knowledge, impervious to patient and carer influence, and sedimented with an accumulation of mandates and activities leading to 'mission drift'; unless measures to the contrary be taken.
9. Obviously the effectiveness of the GP consortia as commissioners will depend on their ability to influence key actors within secondary care providers. Less obvious, but an implication of this research, is that it will also depend on their ability to influence the 'hinterlands' within their member general-practices, because that is where consortia decisions will (or will not) be implemented.

1 Policy context

Networks have been mooted as an alternative governance structure to quasi-markets and networks for modern health systems. 'Partnership' forms of network have emerged as a particular prescriptive form of network governance (1,2) because they are based on cooperation. Networks, it has been suggested, are governance structures better adapted for situations of complexity and instability than hierarchies are (3,4), and more flexible in developing new services (5). They are allegedly an effective mechanism for transferring tacit knowledge, and for transferring knowledge across organisational and occupational boundaries (6). They have been claimed to be based on trust (7), less susceptible to power disparities and more democratic than hierarchies (8), and more inclusive and egalitarian than markets (9) Networks have also been discussed as a solution to the problems of duplicated, fragmentary service provision (10,11)

Against this, there is little evidence that multi agency working necessarily improves service outcomes for children and families (12) and the evidence is thin about whether service integration and partnerships benefit adult service users (13,14). Aldred (15) warns that even with mandated partnerships, collaborative behaviour cannot always be anticipated. Using the example of NHS LIFT (Local Improvement Finance Trusts) she highlights how networks can become closed and communication chains broken. In the USA network-based healthcare integration strategies have met with mixed financial success (16). There remains a need for research exploring whether, when and how networks produce service benefits for health service users.

1.1 Networks in the NHS

Networks have existed in parts of the NHS ever since its inception. Because of the tripartite health system architecture adopted in 1947 the NHS has always depended on networks (enduring informal, non-contractual inter-organisational relationships) of referral routes between organisationally separate general practices, hospital services (of all kinds) and community health services. In effect, these networks provided the first approximation of integrated care pathways from primary to secondary to tertiary care and back.

From the 1920s these routes had become increasingly complex within primary care with the addition of physiotherapists and other allied health professions. From the early 1960s the policy of transferring long-stay patients from hospital to community settings (17) created needs for closer

integration of NHS community and primary health care with local authority (and sometimes third-sector) services. Repeated attempts were made to create local (i.e. county, borough and district level) bodies to co-ordinate these relationships, often with limited success. At patient level, an equivalent approach was to set up what is, in effect, a tailored network for each patient in the form of a case management programme (18), including non-NHS bodies.

New public health policies promoted by the WHO and EU from the middle 1980s focused on inter-sectoral activities (19). The pursuit of, say, smoking control required the formation of policy networks advocating health promotion policies to national governments and their health sector subordinate organisations (including NHS bodies). This approach to public health was re-animated in England with publication of the second Wanless report.

From the 1990s networks became increasingly explicitly adopted as an *ad hoc* managerial and policy solution for the problems of co-ordinating services or constructing lines of political or managerial influence 'horizontally' across sectors. Various nomenclatures ('network', 'partnership', 'collaborative', 'consortia') were adopted. Later, networks became a main focus of 'third way' health policies (see below) and therefore generated a corresponding level of interest among NHS management. It could be argued that the precursor for the pro-network policies of the 1990s and later was a perception of how fragmented NHS primary care was. That stimulated the desire for 'joined–up government' and whole- system working and inter-agency, inter-sectoral working indicated in policy documents during 1998 (20-22) and 1999 (23). New Labour initially attached great importance to the idea of networks linking ('joining up') social care, health care, non-statutory 'third sector' organisations and service users themselves (24-27) and in public health (28).

Cancer networks were the first major extension of acute care networks in recent times. The very first can be traced back to the 1970s, but in recent times these networks mostly grew out of cancer 'collaboratives'. Their conversion to managed cancer networks in the late 1990s (29) had three main dimensions:

1. Reconstruction of care pathways to meet policy targets for admission times for patients suspected of having cancer.
2. Promoting evidence-based clinical practice, with emphasis on clinical audit and (re-)education.
3. A matched programme for commissioning NHS providers to provide cancer care on the above lines.

The re-patterned cancer networks were increasingly completely specified by central government (30,31) and NICE in respect of service organisation, clinical guidelines (32), training and anticipated service outcomes. The Improving Outcomes guidance (33) was made mandatory in 2000. From 2004 compliance was verified through repeated peer review audits. From 2007 NHS commissioners played an increasingly influential role in the cancer networks (34).

The cancer networks served as a template for later managed professional and clinical networks (35-43). For care groups such as patients with coronary heart disease (CHD), 'Collaboratives' were set up as networks linking primary and secondary care for the purpose of disseminating knowledge and best practice, besides the co-ordination of services across different organisations. Many National Service Frameworks (e.g. the NSF for older people (44)) included recommendations for the organisation of inter-organisational collaboration and care pathways. These networks functioned as care networks, managing referrals between primary, secondary and tertiary care; but also as programme networks, implementing national policies for service standards and co-ordination.

Local medical audit networks already existed before 1991 but after that date became widespread in NHS primary care. From 1991 general practice fundholding was gradually extended from individual practices to a system of multi-funds in which a network of fundholding general practices pooled and jointly managed their funds for purchasing secondary and some primary care. These multi-funds, and especially their last manifestation, the Total Purchasing Pilots, were networks of general practices. In many respects these networks anticipated the ways in which Primary Care Groups and Trusts later undertook clinical governance in primary care.

For that purpose, Primary Care Groups and later Primary Care Trusts created and continue to manage networks, of which GP membership was practically mandatory. These networks nearly always had a GP 'lead' and were co-ordinated either through a working group of the Professional Executive Committee or by that Committee itself. At PCT level, such networks generally had non-medical members (e.g. nurses, pharmaceutical advisers) and could co-opt additional members at need, but generally they were numerically and organisationally dominated by GPs. Such networks served two main purposes. One was to promote the uptake of evidence-based clinical practice within general practice. The other was to help implement specific models of care which national policy currently endorsed, in particular (but not only) the National Service Frameworks. Consequently, and as a corollary of their broader responsibilities for local implementation of national health policy, PCTs began to take interest in managing the co-ordination of care for policy-salient care groups. Initially this activity focused

on care pathways, in particular referrals between primary and secondary care. In some cases the membership of these networks overlapped that of the wider networks (Collaboratives) also co-ordinating care for a specific disease groups across primary, secondary and tertiary care. Public health networks developed alongside although they tended to be networks of individuals rather than of organisations (45).

Inclusion of public and patient representation in networks became a regular concern of policy guidance. Local government scrutiny of the NHS was introduced, a form of local networking usually called 'partnership', which involved public consultation, citizen participation, collaboration and partnership (46-49).

The Darzi report subsequently proposed the development of 'polyclinics'. In many places (not least London), however, the proposals do not correspond to the classical European model of an hierarchical polyclinic. Rather, a federated model is often proposed, a 'polysystem' consisting of a network of general practices with a central referral hub for some shared services (out-of-hours services, GPs with special interests, complex diagnostics, limited substitution for secondary care). In the UK (and elsewhere) 'third-sector' organisations were increasingly drawn into the provision of primary health care and social care (50), making more pressing the question of how to co-ordinate these networks of providers.

A big role for networks is still foreseen in the latest White Paper on the NHS (51). GP commissioning consortia will be networks of general practices, possibly supplemented with other primary care providers. The consortia will themselves be members of wider networks ('partnerships') with local government, partnerships responsible for scrutiny of their local health economy and for jointly commissioning certain services. Public health networks will in future be centred upon local government. Services treating uncommon health problems will be commissioned by further networks. The white paper also announces: 'We will extend choice in maternity through new maternity networks' (p.3).

1.2 The changing roles of NHS clinical and professional networks

From October 2006 this pattern of professional and clinical network altered in line with a broader shift of NHS structures in a more quasi-market like direction (52-54). Provider diversification and competition policies were strengthened, including recruitment of both commercial and social enterprises to provide services for the NHS, increasing the number and variety of organisations liable to be involved in services for a given care group. A number of policies – Alternative Provider Medical Services, the

Private Finance Initiative, Local Improvement Finance Trusts and Independent Treatment Centres (the descriptor 'independent' was later dropped) - were all aimed in this direction. Concomitantly the service provider arm of PCTs was separated off from PCTs' commissioning activities. Policy shifted towards client-based commissioning (i.e. linking provider payments to individual episodes of care) through the policies of 'Payment by results' (PBR), 'Patient Choice', Practice Based Commissioning (PBC) and World Class Commissioning (55). Mergers of PCTs and of SHAs were followed by policy changes as to the remit of professional and clinical networks towards a focus on or to advising the commissioners of health services and the development of a unified planning approach to London (56) and the Darzi Report (57). PCTs themselves were often merged and the SHAs were reconfigured.

One consequence of these policy changes was the focus of PCT and SHA interest in networks shifted towards the use of networks to support commissioning work. Another was that PCT-wide networks were in many cases merged when their host PCTs merged. Professional and clinical networks generally remained PCT-centred but most PCTs were now several times their original size. Similarly the bodies replacing SHAs were of regional size, and so became the professional and clinical networks centred upon them. When the present research was commissioned in 2005 the paradigm NHS clinical and professional network, apart from the cancer networks and larger Collaboratives, was a PCT-centred set of around 35 general practices serving a population of about 250,000 people, the policy changes described above meant that during the study period the scale and function of NHS clinical and professional networks changed. General practices shifted from being central to professional and clinical networks to being more marginal members of the networks. The networks were now too large for all general practices in a PCT to participate in even if they wanted to. On the other hand, hospital clinicians' roles in the networks changed from that of a valuable but still marginal participant to being at centre stage.

Meantime there were additions to or shifts in the care groups upon which English health policy focused. Greater priority, and therefore managerial attention, was attached to vascular disease, above all diabetes and stroke. Because of continuing, highly publicised failures such as the Victoria Climbié and 'Child P' cases, children's services remained a policy focus. Failures or problems in children's services attracted increasingly drastic interventions from central government. The scope of many professional and clinical networks widened. The remit of, for instance, CHD networks was widened during 2006-8 with responsibility for vascular disease, above all diabetes and stroke. From 2010 these networks are about to be supplemented – or supplanted? - by GP commissioning networks as outlined above.

In the UK and more widely policy-makers have become interested in discovering what forms of network structure, what managerial practices and what productive activities are most likely to enable a network to realise the policy objectives which policy-makers and health managers have given it. As they sometimes put it: what factors promote the 'effectiveness' of professional and clinical networks?

1.3 Networks as governance structures

One obstacle to answering these questions is the sheer variety of health networks and of the possible functions which they might serve. As networks become more numerous and diverse, the term 'network' becomes correspondingly ambiguous. The concept of networks entered the policy lexicon gradually and as with the life cycle of the cancer networks, the nomenclature has evolved from that of 'collaboratives' to networks in England and Wales to 'managed care networks' in Scotland (58,59). These ideas were then championed in the NHS Plan (60) and reinforced with the adoption of networks as UK Clinical Research Network's preferred delivery and planning structure for research activity, service improvement (61) and comprehensive system redesign (the NHS Confederation's suggestion of the introduction of 'Lean Management' practices into the NHS). So far as health services, as opposed to health promotion, are concerned, care networks were thus the first and paradigm form of health network, with commissioning-oriented networks as developments from them. In Scotland, what are known as 'managed clinical networks' have been defined (58) as 'linked groups of health professionals and organizations from primary, secondary and tertiary care working in a co-ordinated manner, unconstrained by existing professional and (organizational) boundaries'.

Consequently, in NHS usage the term 'professional and clinical networks' does not distinguish very clearly between different types of health networks, being a general label applied on different occasions to clinical governance regimes in primary care, inter-sectoral public health campaigns, extended care pathways, commissioning networks, coalitions of professional interests, 'partnerships' with local government, and indeed almost any inter-organisational collaboration besides the groups of organisations promulgating evidence-based medicine.

At a higher level of generality, a similar ambiguity also plagues research into networks (as we explain below). Of the three generally-recognised types of governance structure, both markets and hierarchies can be conceived as specific kinds of network (62). Networks are then seen as a fundamental generic concept of social analysis. Alternatively, one can conceive of networks as one of the three main types of governance

structure (markets, hierarchies and networks) found in developed industrial capitalist societies.

Underlying managers' and policy-makers' interest in what factors promote the 'effectiveness' of professional and clinical networks is a presumption that these networks are *inter alia* governance structures. Managers might, for example, be able to re-model and influence professional and clinical networks in order to effect current policy ends. When the restructuring of health organisations is the policy-maker's intervention of choice, questions naturally arise of how networks might deliberately be restructured for these purposes. For instance, will the addition of new members – and if so, which new members – make a network more effective in these terms? By such interventions, might managers be able to influence – and make more effective - the collaborative productive activities through which a network achieves its own (and managers') policy goals? Such considerations underlie some of the research questions that we have studied. We have therefore selected the approach which conceives of networks as (among other things) one of three main types of governance structure. This approach is more likely to yield an analysis of networks relevant to the aims of the present research in particular applicability of findings to the NHS and to the SDO research agenda. Because it differentiates networks from other governance structures, this approach is also relevant to health policy debates about the differences between – and the relative merits of - markets, hierarchies and networks as health system structures.

To explore how network structure relates to network performance, we compared seven English health networks. Fuller descriptions are given below but in brief these networks were:

A) Child Mental Health Network. This network linked health and social care in a provincial city. It was a voluntary, informal network of long standing. In the last five years the local NHS and the city council took an increasing interest in managing it.

B) Children's Hospital Project Network. Its remit was to co-ordinate the implementation, and manage the consequences of, a large capital scheme which would almost completely re-profile hospital services for children in a large city.

C) City Children's Network, a Children and Young Person's Trust constructed out of several much smaller networks in another large city.

D) Small CHD Network. Serving a provincial city and its rural hinterland, this network originated as a CHD collaborative.

E) Regional CHD Network: Formed by merging several PCT-wide CHD networks, this network served a large area including suburban and rural areas, and several medium-sized cities.

F) Urban CHD Network: This network originated from the merger of several CHD collaboratives in a large conurbation.

G) Self-Care Network: Patients and ex-patients of mental health services in a provincial city set up this network to care for their physical health.

This brings us to the questions of how to define networks for present research purposes; and what existing research tells about how networks work as governance structures, especially in health systems.

1.4 The development of network research

A deep-rooted trend in both sociology – especially Durkheim's (63,64) - and political thought in the liberal tradition has been to assume that social structures and systems consist at root of stable sets of relationships between individual persons. Since the 1960s there have developed quantitative social network analysis (SNA) techniques for the description and mapping of everyday social interactions within groups. Many US organisational researchers used such techniques to investigate business alliances. A few have applied them to health systems (65-68).

Implementation theory was a second intellectual provenance of network research. 'Top-down' implementation contrasted with implementation of policy 'from' below. An 'implementation structure' (69) is the concatenation of organisations involved in implementing complex (i.e. most) policies, with the aim of producing congruence between policy and practice (70). Rhodes subsequently developed the idea of a 'policy community', the relatively stable set of interest groups whom policy makers normally consult when deciding policy, either by choice or because the interest group is too powerful to ignore (71). A special case, which attracted research interest in the Netherlands especially, was alliances of local governments with common policy or economic interests (72). It was a short step from the idea of an implementation structure to that of 'networks' of non-commercial, 'horizontal' social linkages.

The resulting research literature distinguishes and describes the types of network shown in Table 1.

Table 1. Network types

Policy implementation structures, including	
(a)	Policy communities
(b)	Social movements
Economic networks, including	
(a)	Networks of non-commercial service or product providers (e.g. the free software movement)
(b)	Self-help networks of consumers, including internet-based social networks
(c)	Long-term market relationships which vertically integrate firms
(d)	Long-term market relationships which horizontally integrate firms, for instance as purchasing or selling cartels
(e)	Businesses alliance aimed at resource exchange, market access or circumventing regulations or other restrictions on trade
Sectional interest alliances, including	
(a)	Occupational networks (e.g. professional organisations, trades unions)
(b)	Trade associations

A convergence of these currents in the early 1990s resulted in recognition of networks as a distinct type of governance structure (3) leading to a new stream of research, to which the present project aims to contribute, about governance through networks and governance within them. Research on collaborative networks has come of age with a special edition of Public Management Review in 2008 addressing the performance challenges of these types of network (73).

By way of published research, managerial fashion, think-tanks and consultancies the idea of 'networks' gradually entered English political and NHS managerial discourse, especially after 1997. However this convergence also created the opportunity for definitional and terminological muddles about what counts as a network (74). Klijn's review of a decade of research on networks and governance reveals a tendency for researchers to use both 'governance' and 'networks' as macro-level terms. Moore et al's (75) findings on networks in intermediate care however point to the importance of micro aspects of governance 'on the ground' (p.163).

For present purposes we take 'networks' to mean deliberately constructed groups of (above all) organisations (not 'natural' networks such as families). We therefore define networks as Provan and Kenis (76) do, i.e. as:

groups of three or more legally autonomous organisations that work together to achieve not only their own goals but also a collective goal

(p.231)

Typically this collective goal is a distributed task, e.g. operating a care pathway, which is so complex as to require input from more than one organisation. This definition however leaves unstated the social co-ordinating mechanisms which distinguish networks. Jones, Hesterly and Borgatti's widely-used definition of 'networks' (77), which does mention these mechanisms, is as:

a select, persistent and structured set of autonomous firms (as well as non-profit agencies) engaged in creating products or services based on implicit and open-ended contracts to adapt to environmental contingencies and to co-ordinate and safeguard exchanges. These contracts are socially – not legally – binding.

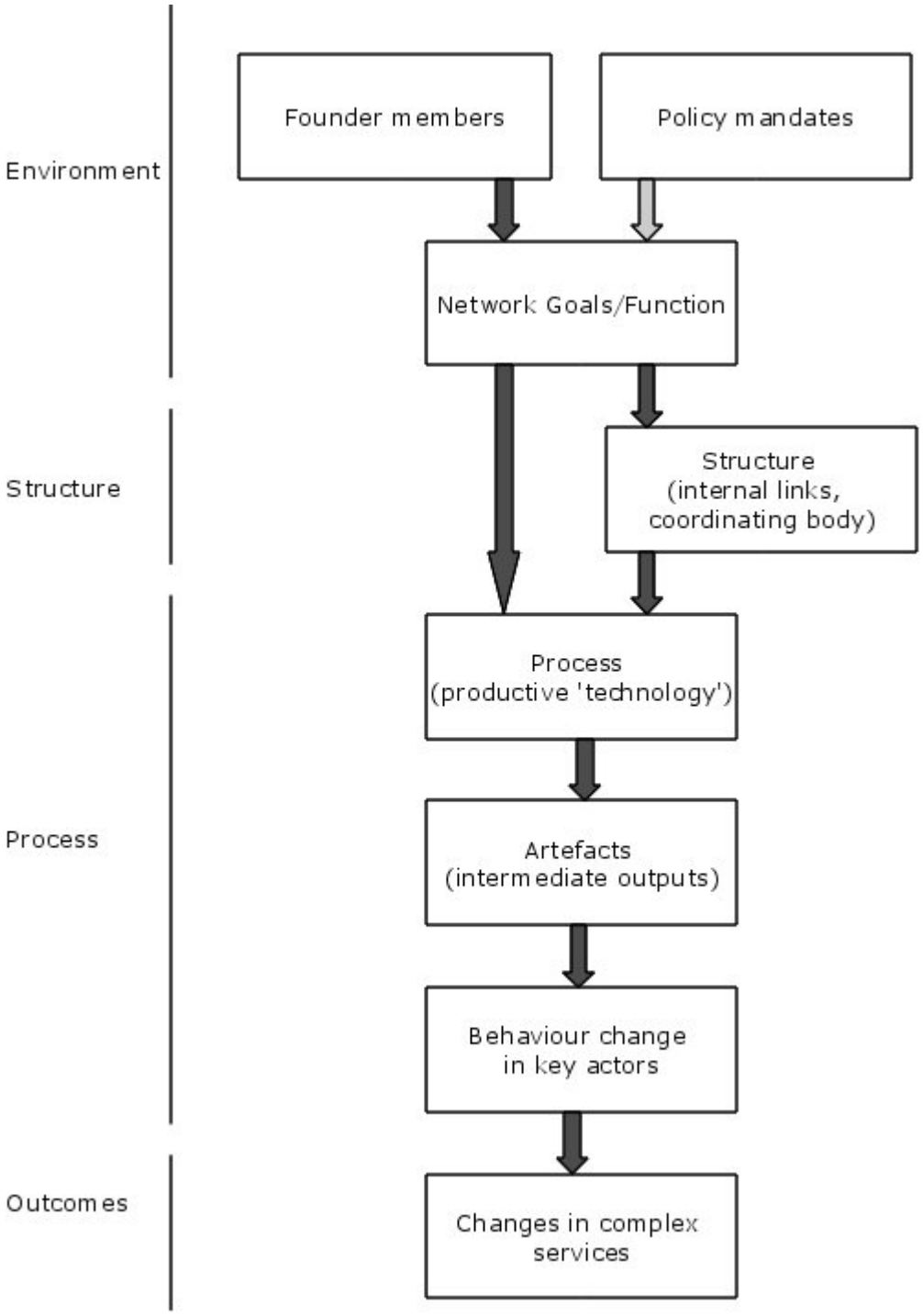
(p.914)

The autonomy and separate accountability arrangements of different partners are retained (78). For health system application, we should note that health networks typically include individual persons (e.g. patients and informal carers (79)) besides organisations.

In the NHS, a scoping study (62) led to the commissioning of primary research into NHS networks including this study. Another scoping study (80) reviewed research on the relationships between organisational structure and policy outcomes relevant to the health sector. To do so it applied and developed Donabedian's framework which analyses health care organisational structures in terms of their health system environment, processes and outcomes (both clinical and policy) (81). Figure 1 outlines the framework, showing the overall sequence by which policy outcomes are produced by way of organisational or, in this case, network structures.

In such analyses 'structure' means 'organisational structure'. 'Process' means not the organisational activities ('organisational processes') which occur within such a structure, but the core productive process – the 'technology' – by which an organisation actually produces the healthcare or other goods and services which are its main outputs or 'artefacts'. 'Outcomes' means 'policy outcomes'. 'Complex services' means 'services which a patient receives from two or more providers in combination'. The present study – indeed, the next chapter - develops that theoretical framework further for application to networks.

Figure 1. Environment-structure-process-outcome framework



2 Theoretical framework and taxonomy

The theoretical framework for the study is conceptualised around eight themes and this chapter is structured accordingly. The themes are :

1. Origins of networks.
2. Mandate of a network
3. Participation in networks
4. Co-ordination of networks
5. How networks are layered in respect of their process and resource flows
6. The nature of their external links
7. The incentives which operate
8. Their performance, which includes processes and outcomes.

2.1 The origins of networks

Voluntarily constructed networks start to form when a potential network membership believe that their existing activities or purposes will be promoted by collaborating. Some networks thus emerge from *de facto* collaboration in a common activity and may develop no further, the network remaining 'emergent'. Or, network development may go further, culminating in explicit negotiation and agreement of membership, activities, objectives and an organising structure for the network.

Trust appears to be an important pre-condition for the formation of a new network and its presence helps in the associated negotiations which occur when a prospective network forms (82). A network whose members have this strong convergence of interests would therefore be expected to perform more effectively than one with no such alignment. Appendix 4 summarises the reasons why co-ordination might, on balance, work better when there is trust between network members. At a personal level, the generation of trust and building of good working relationships ('relationality') is cumulative, so these phenomena and their benefits will be more evident in older networks with a stable membership. There is an empirical correlation between participation and 'trust' (83); a participant's belief that the rest of the network will pursue goals which she shares.

However besides these motivational conditions there are also organisational preconditions which enable prospective network members to trust one

another. In particular, there must be compatibility of business models and the property rights on which they rest, including compatible intellectual property rights which will allow joint operation of a technology (e.g. in the contrasting case, intellectual property rights prevent the sharing of technical knowledge (84)). In short network members' goals in joining the network must at least be compatible, if not complementary or congruent. It depends on the circumstances whether 'mutually compatible' means all the same or not (e.g. to increase market share for one's own organisation) (76). Conditions for network success include the existence of joint pay-offs and collective sanctions against members defecting or 'free riding' (85). The more these conditions of strong and compatible prior objectives held, the more one would expect to see commitment of resources and participation in network activities, lower internal transaction costs of debate and decision-making; and more effective network function.

Health care networks also emerge as by-products of other, *de facto* relationships and organisational structures, including previous friendships and other informal contacts (86). They also emerge out of communities of practice (87-89) and routine exchanges such as those which arise from using a common care pathway. Networks also emerge in response to the need for network members (or potential members) to address some prior task or problem of their own. The latter constitute the initial problematisation of the network and in turn its goals and objectives.

Because much research on network formation concerns market networks and alliances, the problematisation of such activity has often been conceived as directly financial (e.g. to combine market shares, form a cartel or gain market entry); to gain access to commercially valuable resources which network members severally lack but can assemble by collaborating (e.g. to combine different elements of technical know-how, or to combine technical and marketing resources, attain economies of scale or vertical integration) (90) and to manage demand uncertainty, asset specificity, frequent transactions, risk and competition, for instance through flexible use of agencies, outsourcing and subcontracting (77,91-97).

Much as organisational objectives emerge by negotiation among individuals, network objectives emerge by negotiation among the individuals and organisations which are potential network members. This negotiation may result in a formal agreement, contract or legal personality; or be informal, even tacit. It would be naïve to assume that different prospective network members enter the negotiation with equal bargaining power (resources, legitimacy, bargaining skills). Some potential members play a more powerful role than others in the negotiations (98,99). The interests of some members may then be sacrificed to others' interests, producing uneven degrees of commitment to the network.

The products of negotiation, if a network results, are typically three: explicit collective goals (100); construction of a sequence of activities – the network's 'core process' - to realise these goals; and the creation of an organising structure for the network i.e. known, stable rules for interactions (101,100). Collective network goals emerge from the aforementioned negotiation and, unless one prospective member is in an absolutely dominating position, will for that reason be distinct from and transcend the goals of the individual network members (102). The nature of the shared purpose or common 'values' (103) varies, alternatively attributed to shared political interests; to the operation of a policy network or, as a special case, a policy community (71); or to shared economic interests (104), so that the network acts as an implementation structure or, on a more modest scale, a project team. In any event such aims, purposes or objectives may in principle be explicit, tacit or even concealed (90), shared or discrepant amongst the network members, an explicit founding principle of the network or emergent as the network develops. Individual members' desired outcomes may coincide with those of the network as a whole, but maybe not entirely if concessions and compromises have been made to get the network started. Over time a network may experience re-negotiation 'mission creep' or 'goal displacement'.

Since networks are goal-oriented, one way to classify health networks is according to what their goals, if achieved, would contribute to the wider health system; that is, to classify health networks by their practical function. Southon et al. supply such a taxonomy. It distinguishes the six basic types of health network as:

1. Care network
2. Professional network
3. Project network.
4. Programme network
5. Experience network
6. Interest network

As a working assumption we adopt this taxonomy.

2.2 Mandate

When health systems are largely within the public sector, policy mandate is frequently the source of origin of health networks (2,105-107). The mandate can operate in a number of different ways. Historically, they have included a legal requirement for a collective agreement to practice between profession and state (108) or, in the NHS, a requirement for clinical,

professional or intersectoral health networks. Mandate can produce networks where lack of trust might otherwise prevent them forming.

Mandated networks can emerge in two ways. Given a policy mandate, health organisations may voluntarily form a network in order to implement it. Alternatively a mandate may be imposed upon an existing network (e.g. the formalisation of cancer networks described above). When an existing network is mandated, the question arises of whether its prior objectives, culture and activities will reinforce or countervail the new mandate; that is, how far the residues of the earlier voluntary phase persist and what effects they have on how the now-mandated network operates. Health policy mandates take forms that include legislation; regulation; targets and evidence-based guidance as well as managerial direction from higher authority. A network, or one of more of its member- organisations or individuals, is obliged to comply with these norms on pain of losing resources (real resources, money, authorisation) necessary for continuing their activity. Thus, mandate is in one sense a matter of degree. If a network does not heavily depend on the resources which might be withdrawn if a mandate is ignored, the network is for practical purposes only weakly mandated. In any event, the mandate defines or re-defines network objectives.

Although obligatory, a policy mandate may nevertheless be accepted as legitimate, whether because it comes from an authoritative source (e.g. government) or because it coincides with or reinforces some prior motivation of the organisation or person who is mandated. It may also be accepted without coercion actually being exercised, or even publicly acknowledged. More subtly, the precepts of evidence based medicine (EBM) have what might be called an impersonal mandate (by analogy with Therborn's concept of power (109)). Compliance is necessitated not by the laws of governments but by the laws of nature, if the intended biological or clinical outcome is to be produced.

When the mandate stipulates who must join it, a network is liable to acquire involuntary members with the implication that trust between some network members may be relatively low, and their willingness to contribute or share resources and information. Insofar as they are motivated extrinsically rather than intrinsically (as in voluntary network), incentives or soft coercion may be required to make them comply with network decisions (110). Even for voluntary network members, mandate adds new extrinsic motives for participation. Compulsory membership also removes the option to resolve disputes by exit: only voice and passive non-compliance remain. One would therefore predict the density of mandated networks to be lower than for voluntary networks. (That is, a higher proportion of members in voluntary networks would actually collaborate with each other.) Conversely a mandate

may exclude certain members from the network. Then, mandated networks would be less open to new members and have a narrower occupational mix of members than voluntary networks. Unless they were expressly mandated to accommodate it, mandated networks would also be less open to patient or carer participation. One would therefore expect that service user involvement in voluntary networks is more extensive but uneven than in mandated networks.Often, care networks based on referral routes and patterns emerge long before a mandated, formalised managerial centre is superimposed on them as health managers attempt to manage the pre-existing network. Mandate adds a distinction (76) between internal and external governance. If the external mandator exercises strong control, a network is not necessarily incompatible with hierarchy-like relationships (cp. Canadian long-term care teams) (111). Indeed Ferlie and Addicott (35) argue that although networks without a central body are less complex, a more 'hierarchical' structure appears to help focus their activities on their strategic goals.

2.3 Participation

Network members are already socially 'embedded' before they establish or later join a network, doing so to pursue their own prior objectives and motivations, even if this includes a response to a mandate. Prospective network members who face stronger prior incentives are more likely to commit resources and work for network activities, insofar as they believe that participating in the network will help them achieve the goals which the prior incentives are aimed at. However their pre-network roles also constrain what resources each member can bring to the network and what incentives its members are susceptible to. Emerging networks bring together people who:

- participate purely as individuals. In general, individuals tend to network with others who are like them (homophily) (112-114).
- belong and are accountable to a member organisation but do not formally represent it. Nevertheless, these members may give the network access to that organisation's resources (e.g. royalty-free use of patents).
- represent member organisations in the sense of being formally accredited by them and able officially to commit their home organisation to the network's decisions (e.g. by implementing network decisions on brand-sharing within their own organisation).

Health networks typically have a diverse membership, ranging across general practices, community health services, mental health services, hospitals, commissioners and regulatory bodies each with different forms of

ownership, in contrast to the relative homogeneity of commercial alliances. This diversity of organisations has obvious implications for the development of trust between them and of a common network culture. Nevertheless such organisations in each locality often have histories of collaboration before more explicit, formal clinical and professional networks form.

Different organisational levels (115) are often represented in a single health network which may be a department or smaller sub-unit of a larger provider. To implement network decisions will then require compliance, not only by their individual representatives who participate in the network, but of the whole organisations or sub-units of larger organisations. From the perspective of a network, we call these large parts of the network members' original home organisations the network's 'hinterland', external to the network yet connected to it via 'boundary-spanning' network members. These 'boundary spanners' both represent their organisational interest in negotiations with the rest of the network and, in turn, represent the whole-network interests and decisions back to their organisations (the network's hinterland) for implementation there. Thus the effectiveness of a network will depend upon how receptive these hinterlands are to innovations or policies generated by the network, that is upon whether these organisations have an internal culture which is receptive to new working practices. One would therefore predict that organisations with more extensive network links are more likely to engage in innovation-related activities (e.g. care pathway reviews, piloting new models of service delivery) because they have more sources of new ideas; but also that the impact of these links upon innovation would be moderated (or perhaps potentiated) by the organisation's internal culture.

Adding new members might be expected to change the network's internal balance of power, co-ordination and governance regime (116). English health policy appears to assume that adding patient and public representatives makes the network more responsive to network users because the new members gain a voice in network decision-making and so influence what the core process produces. If network membership is mandatory, the network becomes an 'enclave' (62) in the sense of having a formally defined membership (and exclusions from membership).

2.4 Co-ordination

The formulation of collective goals makes the network a means of rational co-ordination in the sense that network activity becomes consciously goal-directed rather than having only implicit objectives. From the point of view of network research, it becomes logically possible to assess the instrumental rationality ('effectiveness') of network activities, and to identify its core processes as those intended to attain those goals. This rationality manifests

itself in terms of activities that are transparent, ordered, formalised and systematic. Network structures can subsequently be analysed in terms of network membership (network 'nodes'), the links between them, and the co-ordinated activities which these links are used to conduct. The analysis which in this report has been conducted via qualitative case study analysis and social network analysis (SNA) of the four most often discussed elements of networks: patterns of links, resources, norms and dynamics (117,118). Empirically the strength of the link ('social tie', 'bond') between actors has been measured in a number of ways, including: the time actors engage with each other; the intensity of emotions between actors; the level of business between actors; and whether the actors interact through exchange, coercion or conflict (119).

The two fundamental modes of network co-ordination are emergent and managed co-ordination. All functioning networks have the former. It occurs spontaneously by self-selection of roles based on an existing division of labour among network members so that overall network activity emerges as a resultant, but not necessarily one that any network member or members deliberately planned or effected. As in a market, deliberate local co-ordination occurs but only an unintended *post-facto* global co-ordination. It is a *de facto* system of participative co-ordination shared among network members with no overall manager or controlling organisation (76). For the reasons outlined above, voluntary networks would be more likely to have relational, trust-based internal co-ordination and role-negotiation than mandated networks would. Walker et al. (120) and Pope and Lewis (121) identify the importance of brokers within the networks as key components of network effectiveness, reinforcing previous findings (122) about collaboration.

Besides common goals, the negotiations which found a network may also lead to the creation of a co-ordinating structure, often referred to by a variety of terminology including the network 'centre' or 'core' (123), 'co-ordinating body' or 'co-ordinator'. Managed co-ordination is the work undertaken by the central co-ordinating body that mediates the links between (other) network members. At its most complex, in health care relational co-ordination involves a unified, multi-agency organisation charged with providing all care for a patient group (124). Although co-ordination activity is in addition to the network's core activity, the network's transaction costs are nevertheless lower than in a market or a hierarchy because when network participants' trust in each other's reputations, transactions can occur without contracts or bureaucratic controls (125).

From the viewpoint of all the network members not just the co-ordinators, deliberate co-ordination (management) of network activity is intended to make the network more effective than would be the case if the network

relied only on emergent, participative co-ordination (76). Deliberate co-ordination has this effect to the extent that it makes the core process:

- Complete: all activities and links necessary for the core process are available, linked in the necessary sequence, obtain sufficient inputs by exploiting the resource 'infrastructure' possessed by each member ('node') (126) and have sufficient capacity to produce the required volume of intended outcomes (e.g. patient throughput).
- Effective, i.e. based on valid science. External ties allow such knowledge to enter the network (112,113,127,128). Closure (129) or very dense or homogeneous network structures (130) prevent it.
- Consistent: When a network operates two or more incompatible core processes they counteract each other to produce (at best) a policy 'mess' (131) or (at worst) 'gridlock' (132). Hence the co-ordinating structure requires a decision-making process for resolving any such conflicts.
- Relevant to the network's objectives. A core process would be irrelevant to the network if it only worked effectively in another setting than the one to which the network now applies it (18,133).

It is an entirely contingent, empirical question whether a given network's co-ordinating body actually achieves this 'deliberate' co-ordinative management or instead creates what Sparrowe et al.(134) describe as 'hindrance networks'.

2.4.1 The co-ordinating body

The selection of the central co-ordinating body, or of the person who acts as co-ordinator, can be by representation; *ex officio*; election; self-appointment by a lead organisation which founded the network around itself; credentialisation; or creation by an external mandator for the specific purpose of network co-ordination, making it what Provan and Kenis (76) call 'a unique network administrative organization (NAO)'. They hypothesise that as networks develop their governance will tend to shift from relatively participative, democratic, egalitarian forms to more centralised, brokered, formal governance. Thus, the co-ordinating body has an important moderating role in most network activity.

In turn a central co-ordinating body is more likely to promote network effectiveness, and therefore develop, when the following conditions apply:

- There is high interdependence amongst the network members in the core process. (Otherwise they would have little need to co-ordinate their activities.)

- The core process is so extensive and complex that it is not spontaneously obvious to each network member what needs to be done and when. (Hence explicit, systematic co-ordination of their work is needed.)
- Network members' goals are not fully compatible, making a decision-making system for resolving conflicts necessary.
- Strong relationality has not yet arisen through repeated personal contact or been reinforced by the experience of rewarding collaboration. One would expect this condition to hold in newer and larger networks.
- Monitoring the core process is difficult because it is not obvious whether the intended outcomes are achieved (e.g. the outcomes are complex, hard to measure, multi-dimensional, long term and confounded by factors external to the network).
- Accountability to bodies outside the network is required.

The more these conditions apply, the more likely it is that a network co-ordinating body will be formed and the more elaborate it is likely to be (76).

Thus the co-ordination of a network has two requirements. The co-ordinating body applies a second-order, co-ordinating process to the core process; and it must have a set of links which give it a 'footprint' on the network's core process. The second-order co-ordination process has three essential stages:

- Real-time monitoring about problems, gaps or deficiencies (compared with the networks' objectives) in the core process.
- Decision-making across functional, organisational and professional boundaries with the collaborators taking collective responsibility for the output (Liedtka 1998) to resolving problems and disputes, and remove 'mess' (different network members simultaneously pursuing incompatible activities or objectives). Decisions and recommendations are intangible, made concrete only in such artefacts as documents and in the network's actions.
- Implementation of the decisions. These artefacts have then to be transmitted into the core process and applied there, which often depends on member organisations' or departments' resources beyond its boundary, in the network's 'hinterlands'.

Empirically little is yet known about precisely how co-ordination effects network performance (76).

Networks lack many of the levers of control usually found in hierarchical organisations (98) and in markets. Nevertheless a network co-ordinating body can changes members' behaviour by applying one or more of the following inducements for network members to implement the collective decisions:

- Prudent reciprocity, achieved through help in kind. In some non-market settings reciprocation may only occur after a long, ill-defined time and the condition or obligation is only tacit, not stated (as in the Russian customs of *blat* or *lapa* (135)). Another description of this governance mechanism is as the managerial creation and manipulation of contacts (136). A concomitant is to maintain good informal, social relationships among individual network members ('relationality').

- Allocation of resources or use of financial incentives.

- Appeals to the shared values (normative assumptions) making up the network's macroculture (as distinct from the culture or 'microculture' of its member organisations (137-139)) including, especially in heterogeneous networks, appeals to non-instrumental values (86,140). Within networks whose member organizations have different cultures but pursue shared goals or tasks one might expect over time to observe a 'cultural blending' (141) into a network macro-culture; or, if the member- organisations' own cultures are more resilient, a 'cultural mosaic' (142). In the absence of a strong macroculture more shallow and transient, but nonetheless shared, normative assumptions about particular problems can also be created by negotiation between network members.

- Technical persuasion and authority based upon scientific knowledge. In general, this is the activity of knowledge management. In health systems the main form of knowledge management is evidence-basing, concretely embodied in such artefacts as guidelines and formalised clinical pathways (143-146).

- Governmentality through the monitoring of network activities and members' contribution to each. Governmentality rests upon the combination of transparency of information and a strong network culture. When each members' contribution, or lack of it, to the network's core activity is transparent to other network members, the network member is exposed to peer pressure or to the (real or imaginary) threat of intervention by some external body (147).

- In commercial alliances, contracts and formal articles of agreement (juridical instruments).

By these means network co-ordinators can monitor, and if necessary correct, progress toward achieving the network's objectives. This is achieved less by power rather than by the appeal to the authority of the network and its co-ordinating structure. We also know from the literature that multiple governance mechanisms are likely to be more effective than a single mechanism (148,149) because they make the requisite practice more salient to those expected to apply it (150,151).

2.5 Layering

Network links can be seen as conduits for the flow of inter-personal resources (126). The resources transmitted include real resources, above all transmitting intermediate products (work in progress) from one stage of the network's core productive process to the next (which in healthcare means making patient referrals); information, above all 'real-time' news about how network members are carrying out the core activity; knowledge about how to make the core process technically effective (or more so), for example by evidence-basing it; social, emotional and psychological support and friendship, most often through face-to-face contact (Kersner 1999); and money (grants, gifts, contracts or budgets). One can thus decompose a network into a number of different 'layers' of links. Each layer is differentiated by the kind of resources that it transmits. Links transmitting patients (referrals) would constitute one 'layer' of the network, the links transmitting information another layer, and so on.

Two main types of 'layer' of links in clinical and professional networks are those which:

- produce the outcomes (activities, artefacts) which the network's objectives state and constitute what we have called the 'core process' of the network. Which specific types of resource-transmitting link make up the core process will depend on what the network's objectives are and will therefore vary from network to network. We consider this point further below.

- co-ordinate and motivate the activity of the network members who participate in the core process. These layers transmit (for instance) financial incentives; mutual help-in-kind; normative beliefs (network macro–culture); and monitoring information about the core process.

Since the second group of layers is ancillary to the first (152) one would predict that the network layers through which the core process of a network are delivered will be denser than the other layers.

2.6 Openness: external links

For the transmission of knowledge from outside the network to within it to be a managed activity, the network co-ordinating body needs to have a number of external links and to maximise the effect of these links a network needs to either create or use relational co-ordinating structures.

These external links take many shapes such as professional links and accountability to external mandators. They are of practical significance for a health network as:

- sources of knowledge and innovation. Most networks have 'structural holes' where links between members are relatively sparse. The few links which do bridge these structural holes are disproportionately important as routes by which the relatively separate 'partitions' or regions of the network acquire knowledge, innovation and other new resources (112,113). The same reasoning applies to links between a given network and the wider social fabric in which it is embedded. That implies that network members with more external links are more likely to display higher levels of innovation. Having more, and more fluid, external links, open voluntary networks are therefore likely to be more innovative than closed ('enclave') mandated networks.

- potentially rival sources of authority or power over network members. In health systems professional bodies, in the sense of uni-professional networks promoting the interest of just one occupational group, are the most obvious potentially rival authority (111,153,154).

- a medium for exercising external accountability and control, indeed governance, over a mandated network.

Again, in the interest of effectiveness network members with external links would have also to possess the internal links by which to transmit to other network members the knowledge and other resources obtained through links outside the network. They would be mediators or 'brokers' between the external and the internal links.

2.7 Incentives

The distinctive character of networks is often attributed to the incentives within them. The incentives – or rather, motivations – for network members are typically the prospect of help in kind, acquiring knowledge, maintaining good social relationships and realising wider values that the network members share (155). Not least among the latter is the motive of realising the network's founding objectives (76,156). These incentives differ from

market incentives in being asymmetrical and hence in relying heavily on trust and reciprocity over a long period (157-159). In contrast, market incentives are essentially financial. Typically a money payment is made and symmetrically the buyer soon receives in return 'real' goods or services to the same value. Within hierarchies, control over incentives is ultimately vested in the chief executive. A network map would show a 'hub-and-spoke' pattern of unidirectional links transmitting both instructions and payments from her to her subordinates (160,161).

The more a network relies on a particular kind of incentive, the closer the structural match between the layer of links which transmits that incentive and the other layers of links in the network. 'Structural match' means that the layers would be similar in density, involve the same network members and exclude the same network members (who in network terminology would be 'isolates').

Depending on the circumstances, these resource dependencies may be satisfied by the networks members' own inputs and contributions to the network, but otherwise the network becomes dependent on external resources to undertake its work. Above all, the network may depend for these resources upon its boundary-spanner members mobilising them in the network's hinterlands.

2.8 Performance

A network's 'performance' (or 'rationality', 'effectiveness' and similar normative terms) can be defined as its propensity to realise the jointly-agreed goals on which the network was founded and which the network members pursue collaboratively (76,159). These goals may include externally-mandated targets and similar requirements, but need not. Voluntary networks have only internally-generated goals. Working back from these goals, health networks typically attempt to realise them in the following way.

To realise the network objectives it is necessary to change the behaviour of certain key actors: in health networks, typically clinicians and health care commissioners (for health care objectives), or consumers, firms and government (for public health objectives). Whose behaviour and which behaviour changes it is necessary to change may, depending on the case, already be specified in epidemiological, clinical or organisational evidence, or be stipulated by any mandate the network is under.

To produce these behavioural changes among the key actors, the network members collaboratively produce certain artefacts and distribute them to the key actors. Collaboratively producing the behavioural changes by means

of artefacts is the network's 'core process'. Goodwin et al. (62) call it 'joint production'.

Depending on the circumstances network artefacts may include practical, symbolic or social artefacts. Practical artefacts directly produce the network's intended outcomes. Symbolic artefacts which physically represent the network's culture or values, for instance as logos or publications (162). By 'symbolic' we mean 'intended to legitimate the network either to its own members or to external audiences'. Social artefacts are the social interactions which networks involve and which serve members' non-rational needs (for example friendships) and irrational needs (163,164). They are sometimes what members most value about a network. One would expect voluntary networks to be more likely to serve such purposes than mandated networks. Writing of networks of local government agencies the 'Dutch School' (72,165-167) therefore advocate re-orienting policy evaluation away from 'goal achievement' towards network members' judgements on the processes and quality of interaction in the network (155).

Network performance is thus the consequence either of the network producing the necessary final artefacts; or, if the network cannot do that directly, of its distributing to the actors who can, such intermediate artefacts as will enable and stimulate those key actors to do so. Either way, the more fully linked network members are, especially the member organisations which contain the key actors, the more likely is the network to perform as its members intended. But at the same time, a core process is more likely to be effective the fewer successive stages, hence the fewer links, it has. For each successive link is an opportunity for transmission to fail or for goal displacement to occur. Hence smaller, simpler core processes (e.g. providing a few narrowly-defined services) are more likely to work effectively than more complex or extensive ones (168). Local networks are more likely to do so than regional or national ones. Networks with direct links between the members conducting successive stages of the core process are more likely to succeed than those in which those members are only linked indirectly, for example via a central co-ordinating body.

Southon et al. (169) identify six different functions which health networks may serve. It follows that each distinct function involves and requires a correspondingly distinct core process. We therefore next outline what their respective core processes are and how they differ (Table 2).

Table 2. Health network core technical processes

Network type	Core processes
Care network	Care pathway and its component clinical interventions.
Professional network	Occupational closure, jurisdictional control, collective bargaining, 'capture' of official positions, professional discipline, credentialisation of workers and working practices, lobbying, sanctions through direct action.
Project network.	Negotiation to ensure project members make their contribution in the correct sequences. Formal OM and similar project management techniques.
Programme network	Negotiation to ensure relevant organisations' and individuals' comply with the model of care; obtain and allocate resources accordingly.
Experience network	'Technologies' of self-care; user-operated care providers and pathways; lobbying; social marketing; sanctions through direct action.
Interest network	Discussion; exchange of opinions, information.

In a network's core process, the links between network members function as 'transfer devices' (170). What they transfer (their content) depends upon what products or 'artefacts' the network has to produce in order to achieve its goals (function). In turn, the nature of the artefacts to be produced determines what inputs and intermediate products therefore have to be transferred between network members (86). Table 3 shows the corresponding types of inputs (resources) and transmission link on which the core processes in Table 2 respectively rely.

Table 3. Contents transmitted in health network core processes

Network type	Essential inputs and links
Care network	Patients; clinicians; referrals; physical inputs to care
Professional network	Knowledge; Policy-context information; external dissemination of demands to power-holders; links between members of the same occupation
Project network.	Real resources, finance, sequencing of physical tasks
Programme network	Knowledge, real resources, finance

Experience network	Real resources, friendships
Interest network	Knowledge, opinion, debate.

Empirically the present study concerns care, project, programme and experience networks.

2.8.1 Care networks

In brief, a care network provides co-ordinated care across multiple separate providers for a defined care group. Its core process is the care pathway which those patients or clients follow. A care network operates a given, established care pathway or model of care (or several of them).

2.8.2 Programme networks

A programme network exists to replace an existing with another model of care (e.g. WHO 'vertical' programmes, English National Service Frameworks). Here, 'model of care' means both a set of clinical or other interventions (e.g. social work) and the organisational arrangements by which they are implemented. Nowadays new models of care are often specified, at least in part, as a care pathway and matched set of service and clinical quality standards, such as the English National Service Frameworks (NSFs). In any event, a programme network therefore acts as an implementation structure exercising governance over the providers (and perhaps other bodies) whom it is intended will implement the new model of care, accountable to the policy sponsors of the new model. A programme network's core process is therefore a negotiation between the programme sponsors and the other actors (above all, health care providers) who will implement it, and obtaining their agreement to undertake the necessary activities within their own organisations and to make any necessary resource or information transfers. This activity is liable to require ancillary inputs such as knowledge-management, promulgating the new model of care and any ancillary knowledge (e.g. clinical techniques, risk assessment) which it requires; information about the current epidemiological context (i.e. needs for health care), clinical and other therapeutic practice, referral patterns and criteria, patterns of user demand, uptake and compliance with both the existing and the new model of care; and whatever inputs are required for the new model of care itself.

In quasi-markets the foregoing is accomplished primarily through the re-commissioning of health care (and maybe other) providers. In the case the core process is to draft, negotiate agreement, obtain signature for, and execute contracts between healthcare commissioners and providers. Essentially this is a discursive, negotiative process whose concrete artefacts

are contracts and the supporting documentation. The inputs to this process are knowledge of the new model of care, information about existing services, their real-side and financial constraints, patient flows and the existing divisions of labour; and estimates of how far all these can or should be changed in the direction of the new model. Another way of accomplishing the foregoing change might be to reconstruct existing, or to set up new, care networks.

2.8.3 Project networks

A project network has the purpose of implementing a defined change in the resources available to the member organisations. Typically these are 'real-side' resources e.g. re-building, software upgrade, replacement of mains services etc. A project of these kinds does not necessarily imply any change in the model of care being delivered; what is being changed is the infrastructure through which a possibly stable model of care is provided. That model of care may or may not be subject to revision at the same time. The core process of a project network is therefore the sequencing and scheduling of the infrastructural changes, ensuring that new services are brought into operation as the old ones cease at each stage of infrastructure development. Unlike project and programme networks, a project typically has a pre-defined endpoint, time scale and cost.

2.8.4 Experience networks

Of Southon's network types, the experience network most resembles a care network. For when the members of an experience network provide complex services for each other, they will have set up a care pathway. But the experience network's services differ from those in a care network because the people and organisations who operate the latter (practitioners, professionals, clinicians) provide care for other people (patients) than those who operate the care network. The experience network's members use their care pathway for self care, even self-treatment, although an experience network may also include carers or professionals supporting patients' self-help activities. An experience network may (but need not) also undertake the same activities (campaigns, direct action etc.) as policy networks.

In summary, network goals determine the core processes required to realise them. The content and sequence of links making up the core process is technically determined and so are the inputs required. Together these factors constrain the range of network structures that will allow the core process to be undertaken effectively (or at all). Our research questions focus upon elaborating, exploring and testing certain aspects of these approaches.

3 Research aims and questions

3.1 Research aims

The policy changes described above have provided in the English NHS a natural experiment in which to study the 'dynamic' effects of environmental 'turbulence' upon professional and clinical networks, and the effects of network reconfiguration. Given the policy context, research context and analytic framework outlined above, the overarching aim of the present project was to explore how health networks collaboratively produce the policy outcomes that they do. That is:

1. How the environment, structure and processes of professional and clinical networks influence each other and the networks' performance (policy outcomes).
2. What policy environment and managerial activities appear likely to assist NHS professional and clinical networks in producing these outputs or benefits.
3. Whether, and if so in what ways, network theory would have to be adapted to explain the characteristics of professional and clinical networks in such health systems as the NHS.

3.2 Research questions

Changes in network membership and function (see above) early in the study period meant that the role of general practices shifted from being central to being marginal in all but two of the study networks (where they were marginal to begin with). We therefore re-interpreted RQs 3 and 6 of our original research questions, replacing references to general practices with 'network member organisations' (which might still include general practices). For the same reason we reformulated RQ6 to remove the obsolete assumption that NHS clinical and professional networks are necessarily centred on a PCT. We have also changed the sequence of the research questions to match the logic of the analytic framework above. Otherwise the research questions remain those stated in the original proposal, based upon certain of those in the research brief. Our research questions were:

RQ1: How do networks emerge as rational co-ordination structures? What determines the formation of both mandated and non-mandated networks?

RQ2: In mandated networks, what prior social networks pre-exist and how do they affect the operation of the new, mandated network? Does re-organising network structure disrupt or enhance network processes, or not affect them at all? How does the inclusion of additional occupational groups and other network members (e.g. users) affect performance?

RQ3: What determines the way in which member organisations use relational co-ordination structures (or fail to)? What determines the effectiveness of member organisations' use of these structures?

RQ4: What types of co-ordination processes mediate the above effects?

RQ5: How do the different layers of network, dealing with different media or contents, co-exist and influence each other?

RQ6: How are member organisations within a network tied to organisations outside it, how are these relationships structured, and what effect do these relationships have on how effectively member organisations use relational co-ordinating structures?

RQ7: What effects are produced by incentives to cooperate (or not to)? What match is there between incentives and network structures? In NHS networks for example, how will the shifts to practice based commissioning and payment by results affect network processes?

RQ8: What determines the performance of mandated and non-mandated network structures, and are there systematic differences in the performance of the two kinds?

Network performance, in the sense of impacts on services and service management is considered under RQ8 (rather than RQ3). We took RQ8(a) as a general question about what the determinants of network performance are (taking both mandated and non-mandated networks together), and RQ8(b) as contrasting mandated and voluntary networks in those terms. We interpreted the normative terms 'effective', 'perform' and 'succeed' in two ways. One was in terms of what artefacts the networks produced. The other was in terms of impacts on referral rates for conditions where referrals are known to be sensitive to the level of primary-secondary co-ordination.

3.3 Supplementary hypotheses

In elaborating our research proposal and analytic framework we developed a number of more specific hypotheses which operationalise parts of the above questions in a more precise, testable way. Matching them to the above research questions, we now list these supplementary hypotheses.

3.3.1 RQ1: Network Origins

H1A: Voluntary networks have an occupationally more diverse membership than mandated networks.

H1B: Networks emerge in pursuit of common policy goals.

H1C: Non-mandated networks are created as by-product of other, de facto relationships and organisational structures as the (future) network members pursue shared interests using a shared 'technology'.

H1D: Voluntary networks' processes are more likely that those in mandated networks to emerge to serve non-rational and irrational needs (163,164).

H1E: Mandated networks are created by one or more of:

1. legal requirement for practice, hence collective agreement between profession and state;

2. 'closed shop' or cartel; or by managerial direction.

3.3.2 RQ2: Mandated networks

H2A: Mandated networks include involuntary members.

H2B: Mandated networks are 'enclaves' in the sense of having a formally defined and closed membership. Voluntary networks have fluid membership, mandated ones more stable membership.

H2C: Mandated networks are structurally uniform (within their economic sector).

H2D: Prior voluntary networks persist within subsequently-mandated networks.

H2E: Mandated networks are more comprehensively and systematically managed across the whole network than are voluntary networks.

3.3.3 RQ3: Participation in and use of networks

H3A: Network node (individuals, organisations) connectedness will correlate with innovation-related activity.

H3B: Organisations whose internal culture is more favourable to collaboration will have more extensive (and denser) network links.

H3C: Service user involvement in voluntary networks will be more extensive but uneven that in mandated networks.

3.3.4 RQ4: Co-ordination

H4A: In mandated networks, the co-ordinating body will:

1. have the highest brokerage score in the network

and;

2. be the topmost member of any hierarchical relationships present.

H4B: Mandated networks, compared with voluntary networks, will:

1. be more 'hierarchical'

2. be lower in density

3. have flows of resources mainly from the co-ordinating body to the other network members.

4. have relatively consistent separation. (All members relate directly to the co-ordinating body, and to each other mainly via the co-ordinating body.)

H4C: Voluntary networks will have more relational, trust-based internal co-ordination and roles than mandated networks do.

H4D: Voluntary networks have negotiated allocation of roles.

H4E: Voluntary networks deal with conflicts by exit, mandated ones by negotiation and voice.

H4F: Mandated networks show uniform and formal organisational processes and flows than voluntary networks do.

3.3.5 RQ5: Layering

SH11: Network layers through which the core process of a network are delivered will be denser than the other layers.

3.3.6 RQ6: External links

H6A: (Alternative hypotheses) Individuals with greater local, regional and national links outside the study network will have

1. more extensive links within the network (because they obtain resources from outside the network to share within the network).

Alternative hypothesis:

2. fewer links within the network because non-network links substitute for the network.

H6B: More strongly professionalised occupations are more likely than other professions to have contacts outside the network.

H6C: Each profession is more likely to have contacts outside the network with fellow-professionals than members of other professions.

H6D: Networks with more external links report higher level of innovation-related activity.

H6E: Providers with more external links will have better outcomes (in terms of admissions preventable by primary-secondary co-ordination).

3.3.7 RQ7: Incentives

The above hypotheses H4C on co-ordination (RQ4) and H5A on network layers (RQ5) also operationalise this research question.

3.3.8 RQ8: Performance

H8A: Network nodes (individuals, organisations) with more extensive network links will have lower rates of growth of admissions for conditions where admissions are preventable by strong primary-secondary care collaboration.

H8B: Simpler networks with fewer interfaces are more likely to succeed (in the above terms) than complex ones.

H8C: Outcomes should be best (in the above terms) when each member organisation relies on a few strong relations for most of care delivery whilst a few weak ties are maintained for information search.

H8D: Teaching hospitals will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

H8E: Organisations with an internal culture which more strongly favours collaboration will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

H8F: Organisations with high levels of innovation-related activity will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

H8G: Organisations which are more central to the network will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

H8H: Mandated networks show swift, relatively uniform implementation of mandated policy and activities in the short term, but these outcomes

will be more limited (narrower in range) than in non-mandated networks.

H8I: Voluntary networks' processes are more likely than mandated networks to produce symbolic artefacts and function as social networks (besides pursuing their stated practical goals)

H8J: Voluntary networks show more flexibility and openness to innovation (both organisational and technical), especially to innovations invented or promoted by grass-roots enthusiasts or introduced by boundary-spanners across structural holes (113).

Whilst we operationalised our research questions in terms of these hypotheses, it is in the nature of hypotheses that they are liable to be refuted. We therefore did not limit our interpretation of the research questions to those terms but remained open to the idea that (other) emerging findings might as the study progressed lead us to understand the research questions in other terms besides those stated above. This brings us to the research methods.

4 Methods

4.1 Design

The analytical framework was assembled from published research findings or, where these had gaps for present purposes, by *a priori* reasoning. Our main sources of published research were peer-reviewed studies on networks, especially health networks, published after 2003, the date of data collection for the SDO-funded review of that literature (62). These studies were found by searching the ASSIA and ABI-Inform data bases by keyword, by hand-searching journals such as Administrative Science Quarterly and the Journal of Public Administration Research and Theory which publish relatively large numbers of high-quality studies on networks, and by searching by names of authors (cited above) known to have published relevant research. From these sources we snowballed to others. The architecture of the explanatory framework follows the research questions stipulated in the original calls for research proposal.

Given these research questions, the corresponding hypotheses and the explanatory model which both elaborated, the strongest available study design was a systematic, mixed-methods comparison of networks. The comparisons combined data from longitudinal case studies with, for most research questions, 'quasi-quantifications' of network structure by means of social network analyses (SNA), as Corviello (2006) recommends. Using a set of seven main study networks, the research design was to make comparisons:

1. between whole networks.
2. within each network, between:

   (a) different 'layers' of links, contrasting links for direct patient care, for patient care organisation and for administration, links mediated by help in kind and those mediated by money.

   (b) members (nodes), taken as instantiating organisations and occupational groups

Contrasts between study networks (or layers or nodes within them) were used to explore how differences in network origin, function, structure, performance and development might be causally related. Similarities between the study networks were the basis for the induction of common patterns of causal relationships across all the study networks. Common analytic frameworks were applied to all the study sites (171), making the

comparisons systematic. Findings from the comparisons were used to revise the analytical framework as unexpected patterns or findings emerged (172).

Research question by research question, Table 4 overviews the resulting research design.

Table 4. Contents transmitted in health network core processes

RQ	Research Design
1a. How do networks emerge as rational co-ordination structures?	Induct patterns across longitudinal case studies of network emergence, formation, re-organisation and transition from voluntary to mandated status.
1b. What determines the formation of both mandated and non-mandated networks?	
2a. In mandated networks, what prior social networks pre-exist and how do they affect the operation of the new, mandated network?	
2b. Does re-organising network structure disrupt or enhance network processes, or not affect them at all?	
2c. How does the inclusion of (i) additional occupational groups and (ii) other network members (e.g. users) affect performance?	1. Compare longitudinal case studies of: (a) networks serving different care groups, hence involving different occupations. (b) patterns of user-involvement. 2. Compare activities and artefacts of user-controlled and professionally-controlled networks.
3a. What determines the way in which member organisations use relational co-ordination structures ?	1. Induct patterns from longitudinal case studies of how network members structure and use co-ordination links and activities 2. Cross-sectional test of association between characteristics of member organisations' network position (described using SNA) and (a) innovation-related activities (b) culture in member organisations (c) changes in referral patterns (see RQ8)
3b. What determines the effectiveness of member organisations' use of these structures?	
4. What types of co-ordination activities mediate the above effects?	1. Induct patterns of co-ordination across longitudinal case studies. 2. Social network analysis to test for presence

	/ absence of 'hierarchical' relationships within networks, degree of centralisation of networks.
5. How do the different layers of network, dealing with different media or contents, co-exist and influence each other?	1. Compare social network analyses of different layers within each network. 2. Induct patterns from qualitative accounts of interactions between layers each network. 3. From (1) and (2) induct patterns across networks.
6a. How are member organisations within a PCT-centred network tied to organisations outside it, how are these relationships structured?	1. SNA-based comparison of network members' links inside the network with their links with bodies outside their network. 2. Cross-sectional analysis by occupation of network members' external links.
6b. What effect do these relationships have on how effectively member organisations use relational co-ordinating structures?	Cross-sectional test of the associations between members' links outside the network and innovation-related activity.
7a. What effects are produced by incentives to cooperate (or not to)?	1. Compare SNA of financial and of non-financial layers of links in each network. 2. Induct patterns across longitudinal case studies of network members' self-reported motives for network participation.
7b. What match is there between incentives and network structures?	
7c. In NHS networks, how will the shifts to practice based commissioning and payment by results affect network processes?	Induct patterns of networks' and their members' responses to the development of PBC and PBR.
8a. What determines the performance of mandated and non-mandated network structures?	1. Cross-sectional comparison across neworks of core activities and artefacts produced 2. Cross-sectional test of association between network connectivity of each member organisation (described using SNA) and changes in referrals sensitive to primary-secondary care collaboration.
8b Are there systematic differences in the performance of mandated and non-mandated structures?	

4.2 Sampling

4.2.1 Sampling strategy

The logic of our sampling strategy was to select networks which contrasted in terms of their membership, core process and co-ordination mechanisms. At the outset of the research we assumed that variations in these characteristics would reflect, above all, the care groups of interest to the networks. At individual informant level, the sampling strategy was to select individuals who played contrasted roles in the key process of each network and in its co-ordination, and who brought different professional backgrounds (goals and knowledge) to network co-ordination and core process. Our research questions, research design and sampling logic therefore required selecting networks which differed by:

1. Voluntary *versus* mandated status (RQs 1,2,8).
2. Membership (RQs 2b,2c,3,6).
3. Coexisting with *versus* not coexisting with client-based commissioning (RQ7c).
4. Function, in terms of:
   (a) Acute, medicalised care *versus* more socially-oriented care (RQs 1,2,3).
   (b) the Southon et al. typology (see chapter 2) (RQ1a)

We therefore made a theoretically driven sample of networks seeking maximum variety in terms of the above criteria listed. If the contrast could empirically be found *post facto*, a comparison of 'successful' and 'unsuccessful' networks would also contribute to answering RQs 3b and 8a.

To satisfy sampling criterion (4a) above we selected cardiac heart disease (CHD) networks as representing relatively acute and heavily medicalised care. The evidence base for the commonest varieties of CHD is relatively well developed and treatment (as opposed to prevention) is largely medicalised. To represent more socially-oriented care we initially selected networks of services for children with long-term health problems as defined by Stein et al. (173) because they require high levels of networking between carers, particularly health, social care and education. Families with disabled children deal with many different professionals (174), a situation which the 'key worker' policy is intended to remedy. In the course of identifying children's networks it became evident that children with disabilities severe enough to require long-term service provision by network are a difficult care group to define. At the level of a PCT of the size found in early 2006 (population c.250,000) a clinically unambiguously defined care

group of that kind (e.g. children with moderate to serious neurological impairment) would be too small for patterns of networked relationships (as opposed to a set of disparate one-off care packages) to emerge. We therefore redefined our second study group of networks as those providing services for children with complex, chronic health problems. Our sample thus contained three CHD networks and three children's services networks.

Beyond this point the exigencies of NHS reform constrained our sampling strategy. Our research proposal envisaged comparing mandated and non-mandated CHD networks, and similarly for children's service networks. For children's services networks this was still feasible in 2006 and we accomplished it. However the flow of NHS policy mandates described above removed the variation between mandated and non-mandated status for CHD networks (and increasingly for most other types of NHS network). The voluntary CHD network which we had planned to study was absorbed into a larger, mandated CHD network. These conditions prevented a mandated-*versus*-voluntary comparison between CHD networks. Variety between mandated and voluntary networks in our sample was thus limited to children's services networks, of which we selected one voluntary and two mandated sites, the latter pair contrasting a programme (and former care) with a project network.

Whilst searching for study sites we discovered a user-experience network (Self-Care Network) in the course of formation. Sampling this site offered opportunity to compare this network with the others in terms of age (Self-Care Network was at an earlier stage of formation than we could observe elsewhere); membership (individual patients and their voluntary organisations *versus* networks mainly of statutory organisations); and function (Self-Care Network was a user-experience network).

Our eventual sample of seven networks was therefore:

- one care network for NHS children's services networks, initially a a voluntary care network and at the end the study a programme network.
- one programme network for children's services networks, mandated throughout the study period (though previously a care network)
- one project network for children's services, mandated.
- three NHS CHD networks, all mandated programme networks by the end of the study period but all having originated as voluntary care networks, either as or nested within CHD collaboratives.
- one voluntary network for physical health promotion

Two sites for piloting data collection instruments were selected by convenience. Our eventual sample of study sites allowed comparison by: function; care group; mandate; membership; size; and, for CHD networks, effectiveness.

Within each network we made a qualitatively representative purposive sample of informants to include at least one from each main agency in the network (NHS trust, social services department, charity etc.); and at least one from each of the professions represented in each network. We particularly sought the 'boundary spanners' in each agency to interview where possible. In every case we included the network co-ordinator(s) and, where relevant, the clinical leads for the participating NHS trusts (cardiologists in the CHD networks; most often nurses and psychologists in the children's services networks). The interviewees included were managers (35 including network, commissioner and provider-service managers), patients (21) and consultants (13). The remainder covered a range of occupations including nurses (including midwives and health visitors), psychologists, social workers and GPs.

It soon became clear (see chapter 7) that it would be difficult to define network membership. We adopted the definition:

Confirmed report: members are those who are described as such by two or more other network members.

because this definition offered reliability, was replicable, verifiable and practically straightforward to apply. To get data collection started, one has to make an initial assumption by identifying at least three putative network members and then snowball from them until saturation (no new members are identified by two or more already-confirmed members). Since it is reasonable to assume that the network co-ordinators are members we started the snowballing from them, and this method enables one to check if the original three are subsequently confirmed as members by at least two others. To gather data for social network analysis we sent a questionnaire (see below) to all the listed network members. Being a census, the survey involved no sampling strategy.

4.2.2 Study site selection and access

Following an initial review of government, NHS and voluntary bodies' (e.g. British Heart Foundation, SCOPE, Carers UK) websites, and the combined NHS organisations with which the researchers and their institutes had existing research relationships, we identified seven study sites to satisfy the above sampling strategy.

Despite positive meetings with the network's lead cardiologist and steering group one of the CHD networks decided in January 2007 that they would

not participate in the study. The reasons stated to us were resourcing and structural changes; uncertainty about the future of the network and overload on the part of the four consultant cardiologist members. In two more sites, despite a favourable reception of the project, the re-structuring of PCTs and then networks prevented access for much of the period required for this study. Since we could not access the first study site for fieldwork anyway and were told that in the other two restructuring and its after-effects would continue at least until the project was 15 months old, we replaced these three sites.

Nevertheless the effort and time expended there were not entirely wasted. Our attempts to access all three provided data about the effects of NHS re-structuring processes upon networks. Initial negotiations and set-up meetings provided introductory historical data about the networks. In one case (CHD pilot site) this documentation was so extensive as to provide data which we have included (separately identified) in our findings as supplementary evidence.

Replacing the above three sites we arrived at the following set of study sites, each of which we have pseudonymised. The appended case vignettes describe them more fully, but their characteristics for sampling purposes were:

A) Child Mental Health Network: A care network voluntarily founded by clinicians and managers to co-ordinate services for children under 5 with mental health care needs and their families; transition from care to commissioning support network in the spring of 2008.

B) Children's Hospital Project Network: Project network charged with re-profiling children's hospital services in a large conurbation, including services for children long-term complex conditions.

C) City Children's Network: Originally a care network based on Sure Start projects but early in the study period this site became a Children's and Young Persons (CYP) Trust, a mandated strategic partnership (programme) network for children's and young persons' services.

D) Small CHD Network: Initially a PCT-based CHD care network which during late 2007 and early 2008 merged and was transformed under mandate into a commissioning support (programme) network.

E) Regional CHD Network: Originated from two sub-regional care networks based on earlier CHD collaboratives. Mergers and reforms of these networks, local level networks and the corresponding PCTs took from early 2007 to mid 2008, creating a mandated programme network (commissioning support).

F) Urban CHD Network: Originated as a care network based on CHD collaboratives but early in the study period this site became a mandated CHD commissioning support (programme) network.

G) Self-Care Network: User-experience voluntary network for health promotion for people with long-term mental health problems., established just at the start of the study.

The CHD network which refused access for fieldwork, but about which other data are available, is designated 'CHD pilot site'. The NHS study networks served predominantly urban populations ranging in size from 250,000 (Small CHD Network) to 4 million (City Children's Network). Self-Care Network was active in several adjoining suburbs whose combined population was approximately 60,000. The sites were geographically distributed across south west, south east, midland and north west England.

Table 5 gives figures for individual memberships at the study sites, counted from the latest mailing-list which the study sites supplied to us. Except for Small CHD Network whose figures are for 2007, the figures describe individual membership in the second half of 2008. The three CHD networks had consistently the highest proportion of clinicians, particularly doctor (mostly consultant cardiologist) members. The project network for children's services (Children's Hospital Project Network) also followed this pattern. At the opposite pole, with a substantial minority of local government members were the two networks for children's services, one programme (City Children's Network) and one care network (Child Mental Health Network). In the right-hand column the 'Others' category were predominantly from the third sector. Except for Self-Care Network there were few user-members or none.

Table 5. Study networks: individual members

Network	Members (N) (Total)	Of whom, NHS			Local Authority N	Users N	Others N
		Managers N	Doctors N	Others N			
Child Mental Health Network	133	6	8	50	51	0	18
Children's Hospital Project Network	58	17	24	14	3	0	0
City Children's Network	61	26	2	2	30	0	1
Small CHD Network	18	7	9	2	0	0	0
Regional CHD Network	47	25	21	1	0	0	0
Urban CHD Network	118	43	43	20	0	2	10
Self-Care Network	13	0	1	1	0	10	1

The doctors included hospital consultants (the largest contingent) but also public health doctors and GPs. 'NHS Others' were mainly nurses but also some other clinicians such as psychologists and ambulance staff. Non-NHS 'Others' includes those whose occupation was unknown to us, but the 18 in Child Mental Health Network were mainly from third sector organisations. Because of the change in NHS networks' role and function, and the marginal role of general practices even in the one NHS network that remained a care network through nearly all the study period, general practices were only exceptionally named as network member organisations.

4.3 Data collection

In each site the same sequence and methods of data collection were followed:

(a) Initial semi-structured interview with network co-ordinator.

(b) Semi-structured interviews with other informants; attendance at network meetings; 'grey' document collection (e.g. external consultants' reports).

(c) The network co-ordinator provided a list of network members and identified up to five of them who were best informed to corroborate or correct the list. We then invited these additional informants to verify or correct the list. All and only the names verified by at least two informants formed the confirmed network membership list. Because of the instability of individual (as opposed to organisational) network membership we kept records of who had left the networks and who had joined. By means of correcting membership list 'inflation' (see below) the researchers soon had for several networks a more complete, up-to-date list of network members than the network co-ordinators did. Assembling a membership list took between less than one month (in one site) and over a year (in a network which was repeatedly re-organised). Regional CHD Network produced its list only whilst we were writing this report.

(d) Survey by questionnaire of those listed.

(e) Data entry, cleaning and analysis.

Stage (b) was repeated towards the end of the project, but without repeating all the interviews in full. Rather, we updated our knowledge of the network first of all with the network co-ordinator then made further interviews with any interviewees whose role had been added, or been played an important role in developing the network, since the start of fieldwork. In Regional CHD Network the *de facto* network co-ordinator had been replaced twice over since the start of fieldwork. Once a long-term co-ordinator had been appointed (during the last 9 months of the study) this network began to recover quite quickly and so we repeated document collection and some interviews there.

The aforementioned changes in the role and membership of NHS clinical and professional networks necessitated the research design modifications described above, and the latter changed in turn our data collection requirements in two ways. Case study target interviewee lists were adapted accordingly. Because the role of general practice in the networks had dwindled it became irrelevant to the study network outcomes to collect Quality and Outcomes Framework (QOF) or general practice survey data: or to examine clients' general practice medical records.

4.3.1 Case study data

Case study data were collected by mixed methods, predominantly key informant interviews, supplemented with content-analyses of documents collected from official websites, documents which informants had indicated were seminal, and field-notes made in an 'observer-as-participant' role (175) at meetings. We supplemented these sources with *ad hoc* enquiries by telephone or e-mail. 'Third party' accounts (published research and re-using data from other SDO projects) were included but first-hand accounts gave privileged knowledge of network members' motives, reasons and assumptions in participation in the networks.

Interviews with individual network members used a semi-structured schedule whose categories were derived from the theoretical schema outlined above. It included open questions. We piloted the interview schedules in a PCT which did not subsequently become a study site (see above), testing it on two PCT managers (generalist and public health) and a general practice manager. As a result we made some minor revisions. The resulting interview schedule is in appendix 5. Case study data collection was iterative (176) not only in a chronological sense, but also because a common core interview schedule was re-adjusted before each interview. The researcher selected which themes the prospective interviewee would be best placed to answer, tending as we became better informed about each site to supplement the selected general questions with more specific sub-questions or probes so as to elaborate or check emerging themes and findings.

The study networks and their member organisations varied considerably in size from site to site, and so therefore did the numbers of individual members which ranged from 13 (Self-Care Network) to 133 (Child Mental Health Network). Numbers of member organisations and departments ranged from 3 (Self-Care Network) to 46 (Child Mental Health Network). In all we interviewed 130 individuals between them covering 48 (out of 96) member organisations. Interviews were audio-recorded and transcribed, the data cleaned and anonymised. Informants were offered the opportunity to see and if necessary correct their transcript but few did. Follow-up interviews were conducted by telephone.

Re-organisations of the study networks prevented site access during certain periods (see below), preventing us tracking patient experience of longitudinal continuity of care prospectively for three years. The best available substitute was to record this experience retrospectively, which we did by selecting patients with at least three years' experience (or vicarious experience, in the case of parents) of services which the networks co-ordinated. Members of the seventh network, who were people with long-term mental health problems, preferred to discuss their healthcare experiences collectively so there we collected data on patient experience by

way of three focus groups. We also ran focus groups in two other networks (Child Mental Health Network and Urban CHD Network). For each focus group a cut down version of the interview schedule was used as topic guide. All client data were collected face-to-face.

In one site where we had received conflicting accounts of network activity, and in the user-experience network, we sent the co-ordinator an outline case study for factual verification or correction. In the former site, this elicited the supply of further documentary data. In all sites, we minimised the potential distortions which can arise in analysing qualitative case study data by following the requirements for qualitative research of credibility (check with respondents), transferability, dependability (data stability, reliability) and confirmability (audit trail) (177).

By these means we collected mainly qualitative data on network origins, membership, structure, processes and the artefacts the networks produced. We collected data about about 'official', 'on paper' ties between agencies, whether or not any networking actually took place, and how the member organisations acted through, or reacted to, the network. The case histories included narratives of the events involved in attempts to co-ordinate a network: how problems or tasks for the co-ordinators to deal with were conveyed to the co-ordinators, what happened as a result, and with what consequences for the core process. Service outcomes were recorded as qualitative 'snapshots', describing how the network co-ordinating body operated or changed the network's core process and, insofar as data were available, services for patients.

Using the theoretical framework we constructed a data grid (Appendix 2) into which the case study data were collated. The data grid indicated the minimum data set to collect for each site and provided a way to check that at least the minimum necessary data were collected. It was a means of combining qualitative and survey data, and of exposing any apparent contradictions which necessitated triangulation or further data collection. The attempt to populate the grid also revealed where is was necessary to supplement the data grid with new categories to accommodate unforeseen empirical findings. From the populated data grids case studies were constructed.

4.3.2 Survey for social network analysis

Data for the social network analyses and to supplement the case studies were collected by questionnaire. Drawing upon instruments previously field-tested in US and UK studies (68,146,178,179) we assembled a structured questionnaire (appendix 6), administered on-line but with postal back-up. We pilot-tested this questionnaire and the subsequent data entry and analysis, with a small (N=11) network of professionals of mixed

occupational background and employers (NHS, academic, third-sector) working with patients with brain injury in one PCT. This pilot test established that the grid could produce data of the kind required and was practical to complete. However the categories 'high/medium/low connectivity' proved difficult to interpret reliably so we replaced them with yes/no questions about whether links existed and devised the concept of 'depth' of connection (explained below) to replace 'high/medium/low' connectivity.

The pilot data were then used to test three specialised network mapping software programmes, Visone, Pajek and Ucinet (180). We selected Ucinet because it allows multiple analytic techniques, and gives clear output and presentational options.

Initially questionnaires were distributed by on-line data collection using a web-based survey system (LimeSurvey), chosen because it is tested, secure and as an open-source system its internal workings are transparent. We sent postal questionnaires for network members for whom we had no e-mail address or who took up the option of returning a hard copy by post.

Although a response rate of 100% is not strictly required for valid social network analysis (181) our first experience in a study PCT suggested it would be difficult to achieve our desired response rates of ≥75%. 'Bounced' e-mail messages soon revealed that many of the putative members' electronic addresses were non-existent, yielding either automated 'not found' or 'out-of-office' replies, or messages saying that the alleged member had left that job. Other addressees denied they were network members. (Our questionnaire asked them nevertheless to state why they thought that.) To borrow a phrase from waiting list management, membership lists were inflated. Only in the voluntary network did we encounter the opposite. That network from time to time produced new members who we had previously been unaware of. Table 6 shows membership list inflation for the six NHS networks.

Table 6. Inflation of network membership lists

Site	(1) Initial list (N)	(2) Bounced or obsolete (N)	(3) Denials (N)	Deflated list (N = (1)-(2)-(3))
Child Mental Health Network	133	15	3	115
Children's Hospital Project Network	58	15	2	41
City Children's Network	135	10	13	112
Small CHD Network	18	1	2	15

Regional CHD Network	47	NA	NA	NA
Urban CHD Network	115	12	13	90

We followed up non-responders by sending a postal questionnaire and up to two e-mail, postal or telephone reminders. When the intended respondent was either the sole representative of a member organisation or an individual not affiliated to any member organisation, we also offered a telephone interview or face-to-face interview to complete the questionnaire.

Ignoring Regional CHD Network which was in the throes of re-structuring and lacking a co-ordinator for long periods, at the level of individual network members the response rate was 31% of the individual members (38% of the deflated lists) but these responses represented 50% of the departments and organisations which were network members (Table 7). Across sites, response rates were uneven.

Table 7. Survey response rates

Network	Individuals; Responses / Membership N (%)	Co-ordinating Body: Responses / Membership N (%)	Organisations: Responses / Membership N (%)
Child Mental Health Network	42/133 (32%)	10/17 (59%)	26/33 (79%)
Children's Hospital Project Network	37/58 (64%)	5/23 (22%)	23/23 (100%)
City Children's Network	8/135 (6%)	1/13 (8%)	6/32 (19%)
Small CHD Network	5/18 (27%)	5/18 (27%)	6/7 (86%)
Regional CHD Network	NA/57	NA/13	NA/21
Urban CHD Network	39/118 (33%)	8/34 (24%)	13/17 (76%)
Self-Care Network	12/13 (92%)	12/13 (92%)	3/3 (100%)
Overall	143/462 (31%)	40/105 (38%)	48/96 (50%)

When non-responders excused themselves without denying network membership, it was always to say they were too busy to respond. A further reason for the tiny response rate in City Children's Network is known. Although the network co-ordinators had written to network members explaining and endorsing the survey and asking them to complete it, one

local authority assistant director made the following 'reply to all' response to her electronic questionnaire:

Before anyone responds to this request we need to know some facts. Who commissioned the research. Has it been through an ethics process. What will be done with the results. Can I advise recipients that we await authentication before responding.

Later she acknowledged:

Your reply was comprehensive and clearly you have the support of key chief officers in [city] I am sure given that information people will be happy to participate in the survey.

but by then the damage was done. Subsequently interviewees mentioned that they had deleted the questionnaire because of the AD's earlier e-mail. Regional CHD Network was the one where the long managerial hiatus disrupted data collection.

For five of the study networks we therefore had sufficient data for a social network analysis at inter-organisation level. We transferred the questionnaire data for each question about links between network members into a N*N (square) matrix. Because response rates were below 100% we symmetrised cells where data were missing for one participant in a theoretically possible network link. That is, if person X reported contact with person Y, we assumed that this meant Y was in contact with X. For the small remainder of theoretically possible links where neither party had responded, we set a default value of zero (i.e. no link) on the assumption that non-response to a survey officially endorsed by the network co-ordinators was in itself weak *prima facie* evidence of weak or no network involvement. An opposite problem was where we had more than one response from a given organisation. To consolidate these individual-level data into an organisational-level response we combined all links reported to make the superset of linkages reported by all respondents for that organisation. This method tended to make the sites with the greatest number of individual participants appear to have correspondingly large numbers of external links, reflecting the presumption that these sites were especially active in the network. Also, if we were to make any subsequent normative judgements, for example any critical comments about network completeness and function, it would only be fair to judge the network or organisation at its strongest i.e. assuming greatest density of links.

By these methods we produced one square matrix for each of five 'layers' (money; help-in-kind; direct patient care: patient care organisation; general administration) within each of five networks.

From the ten survey fields about participation in innovations, we assembled a score (one point for each activity ticked). To test whether organisations whose internal culture is more favourable to collaboration will also have more extensive network links (H3B), we constructed a culture score for each

informant, a mean score summarising their agreement or disagreement with such statements as 'I feel comfortable checking with other members of my profession about …' and 'Doctors in my organisation do not fully value my skills and talents.' We assumed that these culture scores for each individual be regarded as evidence of the quality of that individual respondent's linkage with her or his organisational hinterland. To measure the balance between a member organisation's links outside and links inside its networks, we calculated its 'External-Internal' (E-I) index score. H6 concerned the occupational character of the bodies outside the network which network members reported they had links with. For each informant, we listed the non-network bodies she participated in at local, regional and national level. We coded these bodies according to whether they were bodies of the informant's own profession, multi-professional bodies or of unknown occupational composition. Analogously to the E-I index, we constructed a P-M index to show whether an individual's links were predominantly with bodies within her own profession (P) or with multi-professional (M) bodies:

$$\text{P-M Index} = \text{P-M} / \text{P+M}$$

where P is the number of uni-professional bodies of the informant's own profession that she has links to, and M the number of multi-professional which she reports participating in.

We had hypothesised (H10) that outcomes would be best when each member organisation relies on a few strong relations for most of its care delivery alongside a larger number of weak ties for information search. To operationalise this hypothesis we created what Luke and Wholey (182) call a 'service configuration score', expressed as a dummy variable called 'stong+weak'. We defined a 'strong relation' in terms of depth, as one involving at least four of the five layers of link defined above. All other relationships counted as 'weak'. We defined 'a few' as meaning 'a quarter (or fewer) of the number of the organisation's links to other network nodes'. We coded network nodes according to whether they satisfied this 'strong+weak' pattern.

4.3.3 Routine administrative data on outcomes

A critical question was whether or how organisations' (especially hospitals') connectivity characteristics (as network nodes) were associated with particular network outcomes, or rather service, outcomes. We assumed that a relevant outcome indicator for CHD networks and for acute care for children is hospital admissions known to be sensitive to ambulatory care, because strong networking across primary- secondary care boundaries would assist the partial substitution of primary for secondary care, hence a reduction in these admissions. As a definition of admissions sensitive to ambulatory care provision, we used the AHRQ Prevention Quality Indicators

(183) which have also proved applicable to research in health systems more similar to the NHS (e.g. Canada (184), Spain (185)) than the US health system. These indicators consist of ICD-9CM codes for conditions where admission rates have been shown to be sensitive to the provision of primary care (as a partial substitute for secondary care). From these disease groups we selected those relevant to the CHD networks and to acute care for children (184-188). At the time of this study no equivalent indicators existed for the mental health care for young children, nor for patients' self-care. We were thus able to perform this analysis on two CHD networks and one children's network only. For each hospital node in the two CHD networks for which we had survey data, we obtained HES data for the relevant ambulatory care sensitive admissions. This required using the nearest equivalent ICD10 codes instead of ICD9-CM codes for extracting the data. For some codes this was straightforward but for the others the NHS Coding Service advised us what the correct re-coding from ICD9CM into ICD10 was.

Although no equivalents to the AHRQ measures were available for children's service networks, indicators for a similar purpose had been devised for the 'Closer to Home' project evaluation (189), although these indicators also concerned acute care not mental health referrals. They were however already defined using ICD10 categories which avoided the problems of recoding. We therefore also obtained HES data about changes for the 'Closer to Home' indicators for the children's network to which they were relevant.

One way in which HES data are anonymised is by blanking out all non-empty data fields with five or fewer patients. We treated all these cells as having a value of 1. Although the resulting patient numbers are therefore likely to be slightly underestimated, this is a better approximation than treating blanked-out values as zero (which also causes division-by-zero calculation problems) or just omitting them. Any bias is also likely to be consistent across all ICDs and sites.

4.4 Analyses

One research question was answered by analysing qualitative data only, but the others required combining qualitative and a quantitative analyses. Either way the analyses involved cross-sectional comparisons of network data at three levels. Predominantly qualitative methods were used, supplemented with social network analysis, at network level i.e. to compare whole networks. At layer level and node levels, layers and nodes within networks were compared predominantly by means of social network analysis, supplemented with some qualitative analyses.

4.4.1 Qualitative analyses

The qualitative analyses consisted of systematic comparisons at whole-network, layer and node levels. They were systematic in that data were collated, grouped under headings and presented in the same way for each network. For each comparison, we constructed a table whose columns were the study networks and whose rows varied for each research question (or part of a research question). So far as possible these rows and the data in them were simply selected and copied from the data grid of each study network (see appendix 2). When necessary we then added further rows specific to the research question, entering supplementary qualitative data directly from the transcripts, documents and other sources reported above.

Research questions enquired whether, or hypothesised that, networks, layers or nodes would qualitatively differ were answered by making systematic comparisons across sites. These comparisons were between study networks or groups of them which contrasted in terms of

1. Network formation (RQ1b)
2. Mandated or voluntary status (RQ1b, RQ2a, RQ8a, RQ8b).
3. Having undergone reorganisations (RQ2b) during the study period or not. (This was a *post facto* grouping of study sites, which had not originally been sampled on that basis.)
4. Composition of membership (RQ2, RQ3, RQ4).
5. Size (RQ3a).
6. Artefact production (RQ8a).

The findings were were combined with those of social network analyses in the ways reported below. For research questions about which we had made no predictions about how different kinds of network would behave, we compared the data across all the study sites (without any sub-grouping within the six) and by induction noted what common or divergent patterns there were. The patterns were then 'read off' as (qualitative) answers to our research questions about:

1. network histories in regard to development (RQ1a), transition to mandated status and its consequences (RQ2a), and responses to PBC and PBR (RQ7c)
2. Patterns of user-involvement (RQ2c).
3. How network members use relational co-ordination structures (RQ3a)
4. Types of co-ordination activity (RQ4)

5. How network layers interact (RQ5)
6. Individual network members' motivations, including incentives, to cooperate (RQ7a)

For research questions 3a, 4, 5 and 7a these findings were also combined with findings from the social network analyses as reported below.

Additionally we scrutinised the qualitative data for any relevant patterns not anticipated by the above research questions and analytic. These findings were incorporated into the findings and contributed to revising the analytic framework in light of our emerging empirical findings.

4.4.2 Social network analyses

To describe each network formally we visualised the matrices of questionnaire data as network maps, using UCINET's NetDraw network mapping software to visualise the network for each layer. To visualise whole networks we added the matrices for each layer to produce a summary (all-level) matrix for the network. Whilst the component per-layer matrices had binary values only, adding the binary scores of the corresponding cells in each matrix meant that the corresponding cell in the summary matrix was the sum of those scores, i.e. a number between 0 and 5. Each summary cell thus contained an interval measure of strength of the link it referred to, with 'strength' meaning the multidimensionality of the links. We also visualised the summary matrix for each of the five relevant study networks. The resulting summary maps are in appendix 1. The maps immediately showed whether any isolated members or groups were present. However, reflecting the properties of the networks themselves, most of the maps were so dense that summary tables of network properties were usually more informative. Figure 2 is an example of such a map.

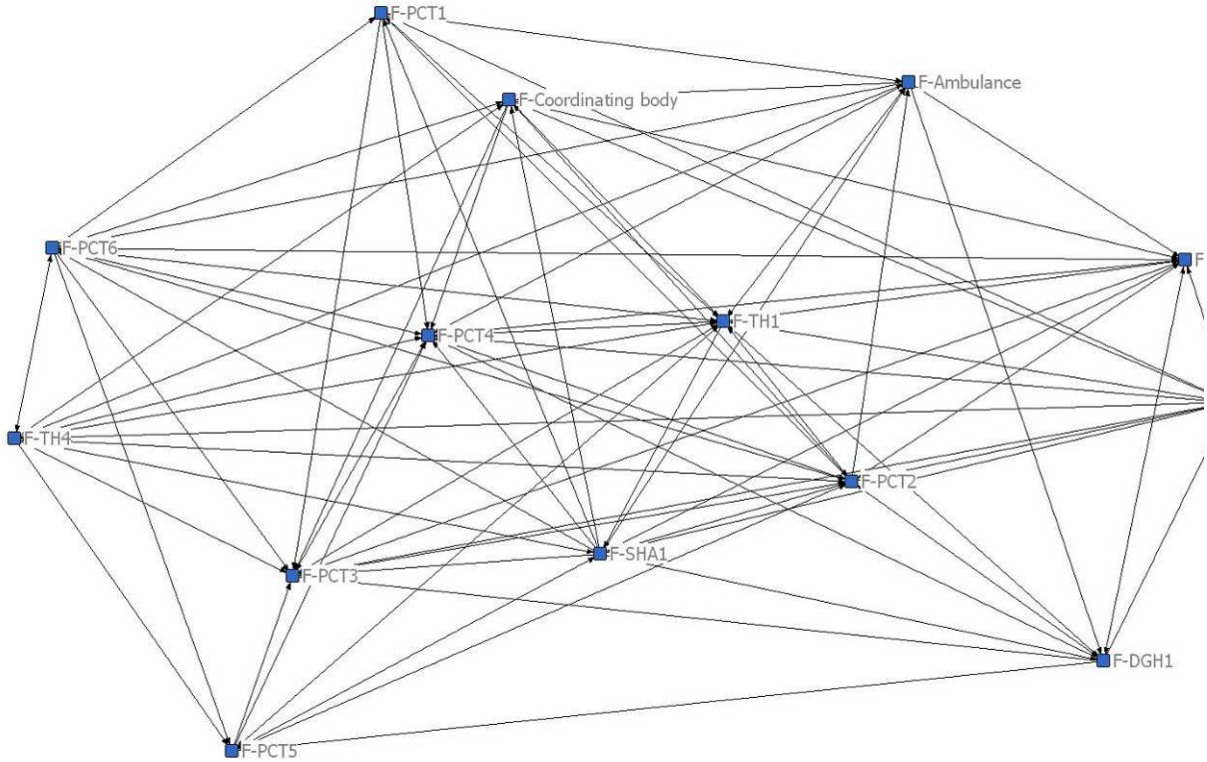


Figure 2. Example of network map

Membership lists for each network, and the demographic data in the questionnaire responses, showed the composition of network membership and which member organisation co-ordinated the network.

Using these materials we then conducted the following analyses. The glossary explains the technical terms unavoidably used (but we have tried to keep these terms to a minimum).

The first set of analyses was conducted at node (network-member) level. Our research proposal predicted that 'an organisation with higher levels of integration into different layers of a network will make greater use of integrated care management (i.e. cross-network referral of patients). Thus, organisations that are more integrated into common network arrangements should perform better.' For these purposes we operationalised the concept of 'integration' by calculating, network by network, from the summary matrices each node's (i.e. member organisation's) measures of:

1. Degree (number of links) of each organisation (node), both in absolute terms and normalised for network size.

2. Centrality within the network (measures were: normalised degree, Freeman degree centrality, reach centrality, betweenness centrality, flow betweenness) (190).

3. Brokerage, that is the extent to which each network node acts as an intermediary between others. We used Fernandez and Gould's (191) definitions and measures. To do this we partitioned the networks (i.e. classified their member organisations) into: NHS providers (NHS Trusts since Foundation Trusts did not exist when the study began; NHS commissioners (PCT or SHA); Local Authority commissioners; local authority service providers; and third sector organisations.

4. Power, using Bonacich's definitions and measures (see (192) and setting the attenuation factor at the conventional rate of -0.5.

5. Openness, measured by the relative numbers of links external and links internal to the network using the E-I index (193).

For short we label the above our 'connectivity measures'. Where relevant we used normalised measures in order to abstract from differences of size between the networks.

The next step was to analyse the questionnaire data and measures so as to answer the relevant research questions. Table 8 gives an overview.

Table 8. Hypotheses and social network analyses

Research question and hypothesis	Data tested for:
Voluntary networks have occupationally more diverse membership than mandatory networks (RQ1, H1A).	Correlation between network status (voluntary/mandated) and: number of professions; proportion of membership represented by each profession.
More intensively networked providers have superior service outcomes (RQ3, H8A)	Correlation between growth of referrals sensitive to primary-secondary care co-ordination and providers' connectivity.
Organisations with more extensive network links are more innovative (RQ3,H3A).	Correlation between innovation-related activity scores and connectivity
Organisations whose internal culture is more favourable to collaboration will have denser network links (RQ3, H3B)	Correlation between internal culture scores and connectivity
Designated network co-ordinating body will have the highest brokerage scores and be the top-most body in any hierarchical relationships (RQ4, H4A).	Association between co-ordinating-body status and: brokerage score; Burt measure of hierarchy; power.
Mandated networks are more hierarchical than non-mandated networks (RQ4, H4B).	Correlation between mandated status and measures of hierarchy.

Network layer delivering the core process of will be denser than other layers (RQ5, SH11).	Significant differences of density between layers in each network. Compare which were pendant, isolate and most-connected organisations in each layer.
Individuals with more links outside a network also have more links within it (RQ6, H6A).	Correlation between internal and external connectivity.
More strongly professionalised occupations have more links outside a network than other occupations do (RQ6,H6B).	Association between occupation and EI ('External-Internal') index.
Each profession will have more external links with its own than with other professions (RQ6,H6C)	Comparison of ratio of own-professional to multi-professional links to non-network bodies for each profession.
Organisations with more links outside the network are more innovative (RQ6,H6D).	Correlation between innovation-related activity scores and E-I index.
There will be a match between incentives and (other) network structures layers (RQ6b)	Significant differences of density between money-layer and other layers of links in each network. Compare which organisations are are central in each layer.
Simpler networks with fewer interfaces would perform better than more complex ones (RQ8, H8B).	Correlation between growth of referrals sensitive to primary-secondary care co-ordination and network size, density.
Outcomes are best when providers rely on a few strong relations for most care delivery plus numerous weak ties for information search (RQ8,H8C).	Correlation between growth of referrals sensitive to primary-secondary care co-ordination and 'strong+weak' index.

To test whether more intensively networked providers (here, hospital and primary care trusts) would have superior service outcomes (H8A), we tested for correlations between the aforementioned measures of connectedness for each provider node and the following outcomes:

1. in CHD networks, the providers' admissions rate for all ICDs included in the AHRQ Prevention Quality Indicators for CHD
2. in Children's Hospital Project Network, the providers' admissions rate for all ICDs included in the the AHRQ Prevention Quality Indicators for children's services and in the Closer to Home indicators for children's services.

To abstract from the differences in catchment populations between the different hospitals in any one network, we used as the outcome measure growth, not absolute volume, of the relevant admissions.

In the analyses which compared connectivity variables within a network we used Ucinet's bootstrap methods to calculate the correlations and regressions because within a single network the data on each node's connectivity are not independent observations. For independent samples we tested correlations using Spearman's rho when there were 30 or fewer data points, otherwise Pearson's r. For certain analyses (e.g. by respondents' occupation, for patterns in referral data) we also pooled data across the networks. Pooling provided sufficient data points for basic multiple regression (OLS) to be applied. As required, t-tests and ANOVA were also used. For all tests we declared the threshold significance level as 0.05 and non-trivial correlation as $r \geq 0.25$. In the event, the Small CHD Network had only three member organisations (one PCT, two hospitals) directly involved with referrals in the relevant categories. Instead of making statistical tests among these three we therefore simply compared referral patterns among them.

Testing the hypothesis (H1A) that voluntary networks have occupationally more diverse membership than mandatory networks only required data from the network membership lists and so we were able to use data from all seven networks.

Comparison of network layers was our second group of analyses. Our main interest in comparing network layers was to examine how far money was an incentive for collaboration between network members. If it was, one would expect to observe a very specific network structure. Network structure consists of links between pairs of members. If there were market-like financial incentives within the networks, the links transmitting money would match the links transmitting 'real' services. For each link transmitting a 'real side' content (referrals, administrative data etc.) from one network member to another, a matching link would in exchange transmit money back in the opposite direction. The presence of these reciprocated financial and non-financial links is a necessary condition for financial incentivisation to be observed. Our methods of data cleaning and aggregation meant that our data did not show the direction in which each link ran, but we were still able to test for the presence of matched financial and non-financial links between each pair of member organisations in each network. We began by finding, for each network, which links for client care collaboration were matched by links transmitting money. We then repeated this comparison for the other three non-financial layers. But more than this was required to show that financial incentives were operative in the matched links that did exist. We

therefore also collected qualitative evidence about members' motives for collaborating through the network.

Comparisons of whole networks was the third set of analyses. To compare whole networks, we tabulated all the above findings (for nodes and for levels) for each network. Using the table we then made the systematic comparisons described above to ascertain whether any cross-network patterns appeared, in particular the following.

On the basis of qualitative evidence, other studies (36,35,194) have described mandated networks as more 'hierarchical' than non-mandated networks, as did H8. We therefore compared mandated networks (we had SNA data for networks Children's Hospital Project Network, Small CHD Network, Urban CHD Network) and the non-mandated study networks (Child Mental Health Network, Self-Care Network) in terms of how far the networks approximated to a hierarchy. To do this we compared the networks in terms of:

1. Hierarchical reduction, using the Krackhardt GTD measure of hierarchy (161). All four items in this measure (connectedness, hierarchy, efficiency, least upper bound (LUB)) must score 1.0 for the network to be a 'pure' hierarchy. Smaller scores measure deviation from a pure hierarchy. An LUB score of 1.0 would show that a single organisation could (theoretically) co-ordinate the whole network in a hierarchical way. If that occurred the network maps would then show whether that single organisation was indeed the network co-ordinating body.
2. Density (predicted lower in mandated networks).
3. Separation: Whether the mandated networks showed more consistent separation (all members relate directly to the core, and to each other mainly via the core) (see H4A). That is:
   (a) Whether the centrality of the co-ordinating organisation was higher in mandated than non-mandated networks.
   (b) Whether the co-ordinating member organisations in the mandated networks had higher betweenness than in the non-mandated networks.

4.4.3 Combining findings from the mixed methods

Our theoretical model provided an overall framework through which to combine the narrower, more specific analyses noted above into a unified explanation of how (and to what extent) the study networks did indeed act as a conduit for innovations and other resources into the activity of managing complex care.

To combine the findings which the foregoing mixed methods had produced, we extended the tables used for the systematic qualitative comparisons on networks to incorporate the findings of the relevant social network analyses. We then compared the combined results for consistency. Any apparent inconsistencies of findings were resolved by re-checking the SNA methods, by using qualitative data to illuminate discrepant SNA findings between sites, and by seeking more precise, subtle formulations of the findings which would combine them consistently. In this way we produced answers to the research questions and decisions as the validity of the hypotheses tested.

4.5 Ethics and research governance

Leicestershire, Northamptonshire & Rutland REC2 approved the pilot study (reference 06/Q2502/27). Ethical approval for rest of the project was obtained from the University of Plymouth Ethics Committee and Cambridge MREC (reference 06/MRE05/62). The latter permitted the project team to vary questionnaires and other data collection instruments provided the REC received final copies, but not to collect data about social and friendship links. No decision was made about collecting data about e-mail traffic, although we were given to understand that a separate application comprehending the collect of informed consents from all individuals involved would be required. Research governance approvals and honorary contracts for the researchers in each site were obtained on an individual *ad hoc* basis (fieldwork began before the research passport scheme). Anonymity of informants and sites was a condition of ethical approval. We have therefore pseudonymised the study sites and removed site names and other identifiers from the references for the 'grey', published and website material cited or quoted in the findings.

5 Network formation

Our findings are presented under the same headings and in same sequence as the research questions and analytic framework. We re-state the research questions (in italics) and relevant supplementary hypotheses at the start of each chapter.

Regarding network formation, our research questions were:

RQ1a: How do networks emerge as rational co-ordination structures?

RQ1b: What determines the formation of both mandated and non-mandated networks?

We observed two patterns of network formation. One was of network emergence 'from below' out of everyday working practices. The other was the deliberate modification or creation of a network to implement a policy mandate. Here we narrate in chronological order how the study networks formed. To speak of network as 'rational co-ordination mechanisms' (RQ1) implies that the networks pursue goals, so we also report how they formed their goals. From the narratives we then draw out common patterns and differences.

5.1 Emergence from below

5.1.1 Long-established networks

One of the two oldest networks was in Child Mental Health Network. Health, local government (social care, educational psychology) and third sector organisations had since the 1980s established patterns of cross-referral, information sharing and collaboration. The initial goals of the network were only implicit: to act as a broker for the exchange of contacts and knowledge for those involved in the care of young children with mental health problems; to enable them to make better use of existing services; and to fill any gaps in the range and volume of available services.

Negotiation to formalise the network began at a conference held on 15th December 2005, attended by over 50 people from a wide range of those involved in mental health care for children in the city, although in the short term 'not a lot happened' (Child Mental Health Network, health visitor 1). A planning day was organised and a network manager, who energised the process, was appointed. A steering group formed and made itself accountable to a Children and Young Persons Partnership that already existed between the PCT and the City Council.

Equally old was the Children's Hospital Project Network, in a large city. This network originated from an attempt in the 1980s by the hospitals and (then) Regional and Area Health Authorities in the city to devise a plan for rationalising children's services, particularly hospital services, which were dispersed over a number of sites, and closing duplicate old and relatively small buildings that were ill-suited to their current purpose. They wanted to concentrate future capital and service developments on just a few well-developed sites, re-configuring primary, community and social care accordingly. The network thus originated as a consultative project planning group for a newly-built children's hospital.

Its membership therefore had to include the main power-holders in making these changes, meaning the administrators (later, general managers), planners and consultant paediatricians. Consequently this network had a more markedly medical membership than the other two children's services networks, particularly its sub-groups and working parties:

There are no managers in the Clinical Network, the only exception to that is CAHMS by the look of it and I'm not sure whether they attend the meetings … But the neonates, paeds and maternity, those are clinical [sub-]networks and you have to be a clinician to get on to them. There's a slight exception around neonates where they're probably going to have a patient and carer representative there, but only by invitation because essentially they are clinical things that are being discussed.

(Network co-ordinator, Children's Hospital Project Network)

The clinician membership tended to be skewed towards secondary and tertiary care.

At a broad, general level the network's goal was fairly clear and consensual. However the more concrete questions of precisely which children's services the network's should develop and which ones it should close were highly controversial, creating the prospect of there being 'winner' and 'loser' organisations and populations. These proposals were hotly and publicly debated in the city and several times re-negotiated between the NHS organisations involved. Specific network goals took over 15 years to reach because of these conflicts of interests:

We talk about it as being a twenty five year trajectory to get us to today. Paediatricians in [city] have been talking for over twenty years about the need to consolidate services in order to maintain quality and safety …. there have been a number of consultations, clinically led, supported by the various organisations, most of which have been unsuccessful. …The one that was ultimately successful was in 1997, … which resulted in the decision to close two children's hospitals … and establish a brand new state of the art children's hospital on the [hospital] site … and the new children's hospital will open its doors in June 2009.

(Co-ordinator, Children's Hospital Project Network).

This network's goals were thus the consequence of a long-term capital planning and service re-profiling activities.

Although Children's Hospital Project Network had a more medical membership, all three children's services networks had a mixture of member organisations as founder-members. These organisations were diverse, including: care providers (NHS, local authority and third sector) for both health and social care; commissioners (indeed a joint local authority and NHS commissioner in Child Mental Health and City Children's networks), and especially in the children's services networks (see below), other statutory bodies (education, police, probation). Two of the children's networks were centred no less on local government than on the NHS. Even the third, the project network for children's services (Children's Hospital Project Network) included representation from all but one of the local authorities in the city. PCTs were represented in their capacity as community health services providers as well as in their commissioning role. Third sector organisations tended to be voluntary and charitable service providers rather than fund-raisers or organisations representing (lobbying for the interests) of specific groups of patients, children, parents or carers.

5.1.2 From collaboratives to CHD networks

We studied three CHD networks and made some preliminary investigations in a fourth. They originated in the late 1990s as local or subregional 'Collaboratives', essentially care networks aimed at managing referral flows and improving standards of practice, with a focus on professional activities and interests. For a PCT to participate in a collaborative was its decision, but once that decision was made the Department of Health supplied specific recommendations and resources.

Small CHD Network was established in 1998, built on existing close working relationships between primary and hospital based clinicians (both for secondary and tertiary care) in an area with a high incidence of heart disease:

in fact there was, sort of, effectively a [city] something called the [city] grouping when I came to [city] seven years ago, which was effectively a [city] CHD network before such things existed, which did a reasonable amount of work around those areas anyway, and there was quite a strong tradition … [of] good working relationships between primary and secondary care.

(Cardiologist, Small CHD Network)

Cardiologists working in and around Small CHD Network were mostly trained in the same nearby medical school and still did occasional sessions there (e.g. angioplasty) so there was also already an established informal network of cardiologists with occasional discussion meetings. There were already long-established close working relationships between primary,

secondary and tertiary care clinicians. The initial membership consisted of commissioners, senior hospital cardiologists, GPs, other primary care clinicians (OTs, physiotherapists, heart failure nurses and community matrons) and managers, and social services. During its care network phase, the network's membership was defined by the organisations who contributed to the equally clearly defined care pathways between primary, secondary and tertiary care. The network became a CHD collaborative centred on the then Health Authority. With publication of the National Service Framework (NSF) for coronary heart disease (195) the network was charged with implementing it. Between 1998 and 2005 the four local PCTs merged into one, but despite these repeated reorganisations both the network maintained continuity of leadership.

Even at this stage Small CHD Network still had no explicit goals. Its deputy co-ordinator could still answer:

Stated aim? I've never seen the aims actually stated on paper I have to say.

(Deputy co-ordinator, Small CHD Network)

the nearest one came to finding stated network objectives were what our informants said they thought the network's objectives implicitly were:

something around the lines of improving cardiovascular care for people in [place], producing a network of care and making sure everyone has access to a high standard of quality care regardless of where within the patch they live and that sort of thing.

(Cardiologist, Small CHD Network).

Other informants from the network also mentioned these as benefits of the network.

In the other two CHD networks, the actors, activities and foci were similar, but the collaboratives emerged sooner at and on a wider (sub-regional) scale than did the PCT-level networks (often based on clinical governance networks) dealing with CHD.

In the part of Regional CHD Network on which we focused, an interested GP set up a group to improve the co-ordination of primary care services, and the primary-secondary care interface, for CHD services. After 2000 this network continued as those sub-networks of GPs and others, within PCT clinical governance networks, but now increasingly focused on implementing the cardiac NSF. It was GP-dominated but some (not all) hospital cardiologists also participated. The foci of interest were initially the local problems of managing the volumes of (and criteria for) referrals from primary to hospital care, and on the provision of post-discharge care for CHD patients receiving long-term follow-up care from primary and community services. The constituents of what was to become the Regional CHD Network were this network and several similar PCT-based networks

across one SHA. Regional CHD Network formed through the merger of these networks. The membership of the resulting network was mainly of hospital doctors and SHA managers.

Urban CHD Network cardiac network grew from a cardiac collaborative established in 2002. It too originated organically from pre-existing professional relationships:

I started off with a collaborative, it wasn't the Network then, it was the CHD collaborative, and my job really evolved since I've been in post, so the job I'm doing now isn't the job that I would have initially have applied for.

(Urban CHD Network: Cardiac Commissioning Development Manager)

A number of areas had developed Cardiac Modernisation Boards and the merger of such a Board with the CHD Collaborative led to the establishment of Urban CHD Network. Then transition to a network with a wider remit appeared an obvious step:

In a way I think it was a natural progression from the CHD collaborative - I was a Programme Manager, and as had been outlined in the NSF of the CHD, it had said that Networks should be developed, and there was nothing much happening at the time, so I suggested that we try and develop a Network, and we did. So we started proceedings in 2003, which was just about interviewing people on their thoughts of clinical networks, what they should be and whatever, and me reading up a bit about it and then establishing it properly, fully functioning I would say.

(Director, Urban CHD Network)

This network's founder-membership too were predominantly hospital doctors and managers from PCTs. When PCTs become predominantly commissioners, Urban CHD Network became a venue for consultation about proposals to bring in new providers sited in nearby PCTs. Here too explicit objectives were late in coming, with the cardiac NSF being a watershed for the formulation of network objectives.

Activity to establish CHD pilot site network began in 2001, aiming to create a common strategy for cardiac heart disease services across two counties served by four main acute hospitals. Its members set it up to solve a common problem facing these hospitals; difficulty meeting waiting time targets for CHD patients and dealing with the consequent budget over-spends, problems exacerbated by Norwalk and MRSA outbreaks. Local PCTs responded by commissioning extra cardiac inpatient capacity in London and another city outside the network's territory. Payment by Results meant that the PCTs also shifted the payment for these episodes to the extra-territorial hospitals. Increasingly, advising a Strategic Health Authority commissioning group became the network's main activity, from the relatively early date of 2003-4. With this activity came explicit terms of reference for the network.

The CHD networks had essentially similar organisational and occupational memberships, being networks of NHS organisations with little local government or third sector representation and no commercial member organisations. Cardiologists were a dominant force but other clinical professions (nurses and ambulance paramedics mainly) were also involved. The common evolution was:

1. Emergence from informal professional contacts and referral patterns of long standing.
2. Formation of clinical audit networks after 1991.
3. Evolution into Collaboratives.
4. PCTs became the local co-ordinating body for existing clinical and professional networks
5. The cardiac NSF was first of a series of specific mandates.

5.1.3 Recent networks

The third children's network in our study was much newer than the other two, originating in its present form just before the start of the study period. Local government played an greater part in its formation even than in Child Mental Health Network. Some long standing network relationships were in place particularly for Looked After Children, CAMHS, child protection and in small, localised Sure Start initiatives which later became Children's Resource centres. In these domains, nascent professional and user (parental) relationships and proto-networks developed. Before the study period professional networks did exist in City Children's Network but were not systematically organised and tended to be uni-professional. Publication of Every Child Matters (196) led to the Sure Start initiatives and the initiation of some new Children's Resource Centres. From these antecedents City Children's Network was formed in response to the policy of creating Children's Trusts.

Because City Children's Network had been set up on the initiative of one member organisation (the City Council), its intended objectives for the network were documented from early in the negotiations to form a network, indeed as a first step towards recruiting other network members:

In those early days of the network being set up I can remember that the work that went on there was very high level, very strategic, I can remember that there was a lot of focus on the tertiary centre and not so much on secondary care or primary care. And I think that's changed quite a lot now and there was varying input between managers and clinicians etc.

(PCT General Manager, City Children's Network)

The network could trace its origins more clearly to a managerial decision which involved, *inter alia*, the setting of tasks and objectives for a to-be-created network:

because of the Government plans, I knew that the local authorities were moving towards Children's Trust arrangements and I guess that some of the networks that I've been in for a bit longer then got subsumed into or co-opted into the Children's Trust network. [...] I'm a member of the children's centre steering group which was the main group that managed and implemented the development of children's centres in the city, you know, the development from the Sure Start, initial Sure Start Children's centre, so that's been co-opted into the overall structure.

(Voluntary Sector Member, City Children's Network)

and:

There has been a large group meeting for many years to sort of be a talking shop for children's services in the city, there used to be about 40 people around the table and back in 2001 onwards. I was involved because I was chief executive at the time so I know about it. However in the more recent time having a very clear, a clearer structure of the CYP partnership board, yes I've been a member since the inception.

(PCT Member, City Children's Network)

This network thus emerged both out of day-to-day clinical work (as Child Mental Health Network had) and (like Children's Hospital Project Network) out of city-wide planning fora. City Children's Network focused its activities not on physical infrastructure but on service co-ordination and on child protection, at that time highly salient in the media and politics.

Newest among the study networks was the user-experience Self-Care Network, which formed in 2006, just as our fieldwork was beginning. This network also developed emergently - with an element of chance involved - from a pre-existing pattern of self-care or health promotion activities undertaken by three mental health voluntary organisations in two adjoining deprived areas in a provincial city. Self-Care Network was a network of a number of individual members who are also mainly users of its activities, three voluntary organisations and (later) the Public Health Development Unit and the umbrella body for the whole third sector in the city. The three member organisations already collaborated on other matters. Another was a member of the PCT's community group network. Links between the three voluntary organisations were long-established but reinforced by friendship links among people who had been patients or clients of the same mental health services in the city.

Most members participated purely as individuals. They were present or recent mental health service users from (as one of them put it) 'user-land', though a minority were also members of other voluntary or self-help organisations. They had had bad experiences of long-term anti-depressant use. Many of them did not qualify for annual GP reviews and rarely saw a

GP. Membership of the Self-Care Network was blurred between those running it and those attending its events. These events in themselves created a network of mental health service users who get to know one another, an outcome of consequence given the social isolation experienced by these service users. Occasionally other people - CPNs, a PCT commissioning manager and during this project some of the researchers (but only one at a time) - also attended network meetings but were never the majority.

Negotiations leading to network formation began in a conversation between two members of local self-help groups who had the idea of linking and consolidating their two local groups. A local GP interested in mental health found out that NIMHE was willing to finance a 'Let's Get Physical' pilot project and with a worker in the PCT's public health development unit began encouraging these groups and individuals to collaborate in bidding, which had not happened before.

For Self-Care Network members their common goal was to meet their personal needs for physical self-care, but also to provide social contact and activity outside the home (which is evidence for hypothesis H1D). Independence from 'service-land' was important to them, a reaction against frustrating or unsatisfactory experience of statutory services. Their first bid for funding prompted them to write down the network's objectives for the first time. Besides health objectives their goals included 'Develop confidence and capacity of third sector providers to engage in health promoting activities' and 'Increase the link between health and other sectors' (Report on NIMHE funded pilot 2006-7) and 'to encourage those users stuck in "service-land" to make use of other opportunities' (pilot scheme evaluation report).

5.1.4 Patterns of origin

In the CHD networks and the oldest of the children's networks everyday clinical work generated repeated contacts between organisations and individual professionals as they referred patients, sought advice, engaged in education or training or other activities of common interest. Over time, repeated contacts of these kinds consolidated into relatively stable networks of links. These networks thus emerged as a means of co-ordinating recurrent, complex care activities which routinely involved many individuals or organisations (a finding which supports hypothesis H1C). In the networks which emerged from clinical care or self-care, network objectives were formulated as a consequence rather than a cause of network formation. Initially the networks had tacit, uncodified objectives only. In five networks the formulation of explicit objectives was slow, often taking years and when formulated expressing what the network was now doing rather than setting

out a manifesto for future realisation. The other two networks had explicit goals from the outset but these goals were at first broad. Agreement on specific goals came later.

Patient involvement in setting up the networks was, with one important exception, minimal. So far as we could discover, there were no users or user organisations among the founding membership of the three CHD and the three children's services networks. In contrast, the reasons for patients' centrality in the Self-Care Network were that:

1. Users founded the network
2. Users dominated its managing body
3. Because this was a self-help network, users also undertook the network's main activity ('core process').

When eventually network members formulated explicit goals for their networks, that enabled the network to organise itself more systematically and attract new members and resources. The networks began to expand, but extensively; that is, by doing more of the things that they always had done rather than by shifting to completely different activities. In the NHS networks one aspect of this consolidation and expansion was that professional links – and by extension inter-professional links – were used to develop the activity focused on specialised work topics.

5.2 Mandate from above

5.2.1 How mandated networks formed

Two of our networks, Child Mental Health Network and Self Care Network, remained voluntary networks throughout the study period, so the following findings do not apply to them, although at the very end of the study period Child Mental Health Network also became mandated. The other five study networks made a gradual evolution from voluntary to mandated network.

Our research proposal hypothesised (H1E) that 'Mandated networks are created by one or more of:

1. legal requirement for practice, hence collective agreement between profession and state;
2. "closed shop" or cartel; or by managerial direction'.

It might be argued that a collective agreement between the medical profession and the state implicitly underlies the adoption of EBM and hence policies which mandate either application of the methods which EBM involves or specific evidence-based recommendations for clinical practice or

the organisation of care. What we unequivocally observed in our study sites was the formation of mandated networks by managerial direction. Thus our findings tend to support only a narrow interpretation of the above hypothesis. We did however find three different patterns of formation of mandated networks by managerial direction. We have called them 'evolutionary capture', 'merger and re-moulding' and 'ministerial intervention'.

Evolutionary Capture For the emergent networks a consequence of a PCT or SHA adopting the role of network co-ordinator was a transition from voluntary to mandated network. For a public body to adopt the co-ordinator's role was generally accepted as a natural, constructive development for network development. As policy mandates relevant to these now PCT-centred networks began to appear, PCTs turned to the relevant network to implement them. Thus its local SHA adopted Urban CHD Network as successor to a Local Implementation Team for the NSF for cardiac heart disease.

This development was in the interests of both the networks and the NHS body which became the co-ordinator. On the one hand, existing networks created by service providers for solving earlier problems were looking for an on-going role. On the other, new policy mandates were for PCTs new tasks and problems looking for means of implementation. The obvious solution for all parties was to adapt the existing networks accordingly. In the CHD networks especially, the co-ordinating PCT or SHA would initiate the commissioning cycle but then request advice or other inputs from the networks, for instance asking the network to deal with a new policy mandate (for example, to implement national standards for stroke care) or a proposal, often from a consultant, for a new or extended service.

Merger and re-moulding. For some policies in some locations, no ready-made network existed to serve as an implementation structure. Then such a network was constructed, either *ex nihilo* or by merging existing networks. Our study included no examples of the former, but did include the latter. City Children's Network was purposefully designed to meet the mandate of children's legislation with its duty for statutory agencies to cooperate. City Children's Network therefore included the relevant statutory agencies: PCTs; the City Council; the Child Protection Board; the SHA; Police and Probation services and the Learning and Skills Council, besides members drawn from the public and voluntary sectors.

As for CHD networks, Small CHD Network was eventually merged into a wider sub-regional network (another former Collaborative). Regional CHD Network was formed through the merger of two sub-regional CHD collaboratives. The merger and consequent restructuring of these sub-regional networks, and of the PCTs they served, was orchestrated by the

SHA. This merger went through at least two stages, taking over 18 months from preliminary discussions to completion. Network mergers were only possible because the networks had already undergone 'evolutionary capture'.

Children's Hospital Project Network evolved into a mandated network through ministerial intervention. As described above, NHS capital planners set up *ad hoc* committees and working parties in the early 1980s to plan and implement a city-wide re-profiling of children's hospital services. A long period of politicised debate and indecision followed. The point at which this deadlock began to break was fairly precisely identified as a consultation among paediatricians and (the then) Health Authorities in 1997. The Secretary of State broke the deadlock by mandating the broad objectives of the project – a selection of the locally-generated proposals - and a time-scale for achieving them. The Secretary of State also specified the governance system – a centred network – by which the network member organisations would manage these changes. Nevertheless negotiations to form the network appeared to drift for some years more until it became necessary to write the business case for the new children's hospital building, stimulating the creation of a Network Supervisory Board in 2003.

5.2.2 Mandate and network goals

Mandate had consequences for network goals, membership, core process, co-ordination and upon how the health system environment affected the networks themselves.

Revision of goals. Over the study period we observed three main impacts of mandate upon network goals. National mandates and their implementation become the goals of the mandated networks, reversing the relationship between nationally-formulated and (such as they were) locally-formulated goals. The networks dealt with this change by describing their role as the adaptation of national mandates to local circumstances:

For cardiac, really, the aim or objectives might be NSF, but the detail tends to be we come up with a plan every 6 months, then we take that to Board, and they sign it off. I suppose the detail of how we do things and how we decide what we're going to take forward is done in working groups and we decide what we're going to do, I don't know, peer reviews - that's how it work. It's all formally signed off by the Board. Although we pull it all together, there's no one individual that sets the objectives like you would normally have in a normal structure.

(Network Director, Urban CHD Network)

Similarly, within the overall framework of its policy mandates, the leaders of City Children's Network perceived a degree of discretion for them to design their future structure and *modus operandi*. Because of the complexity and

scale of this network, they decided to commission management consultants to design a model of working and to facilitate objective setting:

Well the outside [management] consultants' research project was all about getting all the agencies, it's been a piece of work that's been going on for 18 months to 2 years focusing on outcomes and it was developing – yeah they helped develop the logic model and helped us develop a focus on outcomes. So we then had a reason for being in terms of commissioning because we're interested in commissioning for those outcomes.

(PCT member, City Children's Network)

In two networks the shift in objectives however also raised fears among the existing network members that their established collaboration was to be sacrificed to some new purpose.

Sedimentation of goals. As time passed PCTs and SHAs became mandated to implement an increasing range of policy targets, service frameworks, *ad hoc* initiatives, NICE guidance and other central policy mandates relevant to their services (e.g. access time targets, patient involvement policy). For example, Later implementation of the Darzi report became an important mandate for Urban CHD Network. Similarly, in Children's Hospital Project Network National Service Frameworks and further guidance relevant to children's services were added as they appeared to the network's mandate. The sedimentation of new mandates amounted certainly to 'mission spread' and arguably to 'mission drift'. Children's Hospital Project Network more than the others was willing to take on new tasks which, though related to its core purpose, were at times somewhat tangentially so, such as the EU working time directive. Over time the sedimented additional activities became predominant.

Impersonal goals. The EBM-based elements of network objectives survived the transition from voluntary to mandated networks. For these evidence-based objectives have their basis in biological and epidemiological processes which are of course the same for all networks, and beyond policy-makers' control. This stabilising influence on network goals was however more apparent in the CHD networks, whose evidence base was much larger than that for children's services, especially mental health services for children.

5.2.3 Mandate and network membership

Another consequence of becoming a mandated network was a new membership profile, with more managerial, especially commissioner, involvement. These effects were reinforced by the networks' increased size (see below).

A quantitative analysis of network membership confirmed that having a higher proportion of managers was significantly associated with mandated status. However this finding depended on the inclusion of two large

networks. Removing these sites from the analysis also removed the significant association between mandated status and proportion of managers in the networks. It therefore appeared that network size also influenced the occupational profile of network membership. But as already noted, the increase of network size was itself due to mergers, and the mergers due to the networks becoming 'captured' by mandated bodies.

Children's networks were also increasingly mandated to include a range of statutory organisations. City Children's Network especially came to include representation from organisations who were not on, or were marginal to, health care pathways (e.g. police, fire brigade). In contrast the Children's Hospital Project Network had always had a determinate membership. Its clearly-defined task implied that a defined list of organisations should be required to participate, and not others. The participation of local government bodies (in a period before unitary local government) in the Children's Hospital Project Network was more patchy. The most active local authority member was not the one for the city centre itself, but for a group of suburbs (of very diverse socio-economic status and ethnic mixes). Even where there was no mandatory requirement to include them, some organisations had almost *ex-officio* representation. For example, large teaching hospitals cannot reasonably be excluded from acute care networks. In Children's Hospital Project Network senior doctors always played a role, but this role increased as the network's mandate widened after 2000; the soubriquet 'clinical and professional network' became increasingly justified. Conversely, once it became mandated (just after the study period), Child Mental Health Network excluded those former members which its new co-ordinator deemed irrelevant to its new role.

We hypothesised (H2B) that mandated networks are 'enclaves' in the sense of having a formally defined and closed membership. Voluntary networks have fluid membership, mandated ones more stable membership. The above evidence tends to support this hypothesis. Also we hypothesised (H14) that voluntary networks would have occupationally more diverse membership than mandatory networks. Using the membership lists for our seven networks we first counted the number of occupations represented in this list, and then the number (from which we could calculate the proportions) of individual members in each occupational group. The number of occupations was not significantly associated with network status as mandated or voluntary. Managers apart, neither was the proportion of AHPs, nurses, doctors, social workers, other professionals or users in a network's membership significantly associated with the network's status as mandated or voluntary. This pattern appears to reflect the fact that the networks grow by merger, so that their occupational mix continued to reflect their founding membership. So our data did not suggest that

voluntary networks have occupationally more diverse membership than mandatory networks do (i.e. did not support H14).

5.2.4 Changed core activities

A consequence of the accretion of mandates was a change in the balance of the networks' core activities. As described above, Children's Hospital Project Network retained its original function as what Southon et al. would classify as a project network, but also acquired the role of a programme network, redesigning children's services in line with emerging new policy mandates. Elsewhere, a similar effect occurred in consequence of merging former referral networks (which happened in networks City Children's Network, Small CHD Network, Regional CHD Network and CHD pilot network). That made the individual network-members increasingly remote from the day-to-day management of referrals which is the core activity of a referral network. To be sure, cardiologists remained members of the CHD networks, but the merged networks were increasingly focused on managing referral routes and criteria on a large scale, hence for the most part indirectly. So the clinician network members now directly managed only a small proportion of the referrals within the network's remit. Network decisions about, say, referrals were now to be implemented not mainly through network member's own behaviour (as would be the case in, say, a local network of GPs and other clinicians) but mainly through clinicians who were not themselves network members but working in the 'hinterland' of the networks' member organisations. Representatives of member organisations and professions now acted predominantly as boundary-spanners, influencing decisions which (mostly) were taken elsewhere in the hinterland of the network's member organisations.

Furthermore, the content of the mandates themselves shifted the focus of network activity from the maintenance and operation of existing care pathways towards reconstruction of these care pathways on the lines mandated. The fact that the network co-ordinating bodies were commissioners also tended to produce a focus on the overall design of care pathways rather than upon a more detailed focus on referrals and resource use at the level of small care groups. In the sites studied an effect of mandate was thus to shift referral networks towards becoming programme networks.

5.2.5 Network co-ordination

As PCTs and SHAs became increasingly held accountable for policy implementation within their local 'health economies', they were held accountable in particular for the operation and effectiveness of the networks in their territory. Thus the mandated networks except for City Children's

Network came to be 'hosted' by an NHS commissioning body, and in City Children's Network by the local government half of a joint commissioner.

Mergers created sub-regional networks into which Small CHD Network and the forebears of Regional CHD network were merged. Urban CHD Network and Pilot Site CHD Network were already sub-regional in scale, as were Children's Hospital Project Network and City Children's Network. Mergers made the work of co-ordinating the resulting larger network more demanding. 'Hosting' meant that the host PCT or SHA provided managerial infrastructure for the network. These resources were usually more generous than had previously been available to the networks. They typically included a number of managers and office support services. The host organisation became the seat of the network's decision-making bodies and sub-groups. In effect it conducted a good deal of the day-to-day co-ordination of each network, from routines such as data collection and organising meetings through to the setting of agendas for discussions about network strategy and reporting network activity to higher NHS bodies.

5.2.6 Parallel governance

In mandated networks, the mandator was the most important actor in terms of setting the network's objectives, and by implication its core process, the requisite membership and the accountability chain for the network (see findings for RQ2). This actor is however not a network member but, rather is 'off-stage' outside the network; a dominant but so to speak absent or virtual 'member'. The same mandates applied to the networks as to their member organisations but the latter were held accountable through separate governance structures (performance management, contracts, Payment By Results, Care Commission etc.) outside the networks. These relationships were not mediated by the network's co-ordinating body in its capacity as network co-ordinator. Rather, the network served as a parallel, supplementary implementation structure for the policy mandates.

5.3 Summary

We observed two modes of network creation. Voluntary networks emerged 'from below' as groupings of individuals and organisations performing common tasks. These tasks ranged from tasks producing rather abstract outputs (managerial decisions, project plans, information, guidance, service specifications) in documentary form to tangible outputs such as setting up new referral routes and introducing new methods of treatment or self-care. Mandated networks were created 'from above' by NHS 'host' organisations (typically a PCT) taking control of pre-existing emergent networks and then, in some cases, re-structuring them.

6 Mandated networks

On this topic our research questions were:

> RQ2a: In mandated networks, what prior social networks pre-exist and how do they affect the operation of the new, mandated network?
>
> RQ2b: Does re-organising network structure disrupt or enhance network processes, or not affect them at all?
>
> RQ2c: How does the inclusion of additional occupational groups and other network members (e.g. users) affect performance?

We did not use social network analysis to answer these question but tested a series of qualitative hypotheses:

> H2A: Mandated networks include involuntary members.
>
> H2B: Mandated networks are 'enclaves' in the sense of having a formally defined and closed membership. Voluntary networks have fluid membership, mandated ones more stable membership.
>
> H2D: Prior voluntary networks persist within subsequently-mandated networks.
>
> H2E: Mandated networks are more comprehensively, systematically managed across the whole network than are voluntary networks.
>
> H2C: Mandated networks are (structurally) uniform (within the economic sector).

6.1 Network mandates and their sources

Five of the networks were unequivocally mandated networks and were very much driven by national priorities and targets. For both the CHD and the children's services networks, the respective National Service Frameworks were a seminal source of mandates (Department of Health 1998; Department of Health 2002). The most often mentioned mandate was substantive clinical guidance (from NICE especially) and service-model mandates. NSFs were influential in all networks (except Self-Care Network) but always in ways mediated by local expertise.

The evidence base for CHD practice was already well-developed by 1997. Whilst central government, regulatory and NHS bodies endorsed and disseminated these mandates, these 'impersonal' mandates originated elsewhere. They had been developed and promulgated largely by national and international sources: respectively, the professional bodies, such

agencies as the British Heart Foundation and NICE; and in the academic, medical and scientific research publications. Indeed NSFs provided the founding mandate first for local care networks (and clinical governance networks) then CHD networks. As noted, the CHD networks quite readily adopted national mandates on evidence-based practice, indeed saw this as part of their rationale for existence. Network Urban CHD Network would not have been established but for the NSF. Besides the relevant National Service Framework the most influential mandates were, for Urban CHD Network and Regional CHD Network, the national access targets for revascularisation and hyperacute thrombolysis; and achieve the national stroke strategy, achieve the cardiac NSF and its quality standards. Later the Darzi report became an important mandate for Urban CHD Network:

as far as services as they are now will look very different in ten years time with the advent of more services moving into the community and polyclinics and hospitals having different functions … then having your existing local district general hospitals either rubbed out of the equation altogether or having existing services built up to cover bigger geographic areas. So I think the risk of not just having a network and having individual PCTs whilst also having on top of that the strategic health authority in [region] … I think the miscommunication between all of those layers, that there is a risk [of that].

(Urban CHD Network, PCT Commissioner)

This was less of a problem for Regional CHD Network, which was organised SHA-wide.

Children's services remained politically salient at national level and in both that domain and the partly overlapping domain of mental health, a steady flow of more guidance concerned more with the organisation of services and inter-sectoral collaboration than with clinical technique or other client-level interventions had appeared from central government. The children's networks informants and documents also showed that they oriented much of the networks' planning and activities around Every Child Matters. For Child Mental Health Network the NSF on mental health (197) was also relevant, although little of the guidance it contained was specific to children. Other mandates for them were policy guidance about mental health services (e.g. a National Service Framework on Mental Health (Department of Health, 1999)) and the care of children (the Common Assessment Framework, Every Child Matters). Public Service Agreement 12 was important for CAMHS especially. The catalyst for the formation of the City Children's Network as a comprehensive Children's Trust Arrangement in the form of a Children and Young Person's Strategic Partnership (CYSP) came from a number of policy mandates. Particularly, Every Child Matters and the underpinning Children Act 2004 and the Childcare Act 2006 with its ten year strategy for children.

The second major mandate was public and patient participation in the six NHS networks, but the effects were limited. In the NHS networks, lay

participation, although almost always described to us as desirable and necessary, was equally often added on to the network once its main membership and function were established. The two usual mechanisms (not mutually exclusive) were to add a lay advisory sub-group or to recruit lay members to existing network bodies, either permanently or to participate in once-off events such as local conferences (e.g. Child Mental Health Network). In some cases these were individuals already active as, and in that sense accredited as, 'lay representatives' in other nearby NHS bodies.

The Children's Hospital Project Network had a 'very vocal' public partnership board (PPB) which was a sub-board of the Network Supervisory Board and chaired by a representative of a voluntary organisation. Proposals for the re-profiling of children's services had been intermittently reported in the local press for many years and had at times become controversial. As its plans matured, the Children's Hospital Project Network embarked during 2006 on an extensive public consultation, which its co-ordinators described as 'the biggest thing the NHS has ever seen'. Over a period of 16 weeks it had involved over 800 public meetings and elicited 55,000 responses representing the views of some 250,000 people. An external consultancy processed the responses and its report presented a total of 13 options for service configuration, including the five originally proposed by the network.

Turning to the CHD networks, Urban CHD Network had a very strong Heart Support Group and one of their key organisers was a member of the network in her role as a cardiac rehabilitation specialist nurse and acted as a patient conduit for issues raised at the group. Urban CHD Network also ran patient reference groups including users from all trusts in the network. This group favourably impressed one of our informants:

they've worked well with patient groups so that's one thing that you know that the network meetings, there's always some interesting feedback from patient groups. The tricky thing is, again it's this kind of getting representation across all the PCTs, so you know we get feedback from someone from, who's had experience in a trust which is not in our area for instance. But those links are good, you know, I think it's really good to have that kind of feedback.

(PCT public health doctor, Urban CHD Network)

Patient representatives were generally given a slot on the network meeting agendas. At the time of writing Urban CHD Network was beginning to consider extending its professional educational activities to patient education, intending to start with educating patients about life-style after a heart attack.

Due to its managerial and structural hiatus, there was less evidence of patient participation in Regional Cardiac Network. Its activities concentrated on cardiologists and managers producing guidelines, developing services and implementing other policies relevant to CHD.

Small CHD Network was nested in a wider cardiac network, which did much of the patient consultation and involvement work for the local nested care networks in common:

what they [patients] want is good treatment, they want rapid access and good treatment at the time, they don't care who's involved. I know we've done workshops and road shows within A and E departments where we've had patients go in, we did one in [city] at the end of October [2006] and patients and public were invited to come down and were able to swap stories and because they'd been through the system their insights were used, and I know the cardiac networks are keen to have these patients involvement through PPI, so they come in and talk to them, and the people at the network do interviews with patients directly to get their views.

(Ambulance representative, Small CHD Network)

This network also planned to set up patient consultation groups by condition (infarct, heart failure etc.) but this had not yet materialised at the time of writing. These were to be co-ordinated via a fifth sub-group of the network. However:

sometimes the problem is the patients who volunteer to do this aren't always the patients who, often it's the same people, often it's the white, middle class males who volunteer to do it.

(Heart Failure Specialist Nurse, Small CHD Network)

In the Small CHD Network, however, such patient participation as occurred did so at sub-group rather than whole-network level. In Small CHD Network:

clinicians might feel that sometimes patients think what's good for them isn't necessarily… it sounds like a terribly pompous kind of doctor statement to make but sometimes, you know, there are aspects about clinical care that are not immediately obvious to patients but are actually quite important in terms of achieving meaningful clinical outcomes.

(Cardiologist, Small CHD Network)

CHD pilot site network set up a patient participation group with 14 members with a part-time co-ordinator. The most energetic and influential patient representative was active in a number of other NHS bodies intended for patient involvement, indeed recruited from one of them. The NHS-employed network members were interested in the lay representatives' comments but there was a mismatch of focus. The lay members were (not surprisingly) most inclined to comment on the concrete details of service provision – car parking at one hospital site, hospital food - but it was harder to sustain dialogue about the more general aspects of CHD services, the main concern of this programme network. In that respect Child Mental Health Network had better success but it was a care network still interested in just such details. Its activities included open days for the public, clients and any

interested local residents at its new children's centre. So far as we could tell, Regional CHD Network had little public involvement.

Patient and public involvement, in terms of participation in both decision-making and undertaking the network's core activity in the non-mandated user-controlled Self-Care Network far exceeded all the (eventually) mandated NHS networks. The difference was both in the proportion of network activity that user-members contributed and the nature of their contribution, which included active participation in exercise and social events.

Thirdly, the networks faced *ad hoc* policy initiatives e.g. for cost containment in 2005-6, targets for waiting times and, for Children's Hospital Project Network, the EU Working Time Directive which had important practical implications for children's services. In 2007 the Department of Health asked the Urban CHD and Regional CHD Networks to include stroke medicine within their remit.

Although not so frequently mentioned, the reform of NHS commissioning bodies was the mandate with greatest practical impacts on the networks. The concomitant polices of PCT withdrawal from a provider into a commissioning role, provider diversification, patient choice, payment by results and practice based commissioning had equally far-reaching implications. In general these mandates left little discretion about what the networks should do; the networks' freedoms lay in deciding how to implement the mandates.

Less obvious, but important for the functioning and internal governance of the network was what might, adapting Therborn (109), be called the 'impersonal mandate' underlying national guidance and guidelines, insofar as their evidence base was sound. This mandate arose from the underpinning clinical, aetiological or epidemiological evidence itself. Its strength therefore depended on the strength of the evidence base and of the science underlying the guidelines. This mandate was stronger, in the senses of being more detailed, having wider coverage and being more convincingly substantiated, for CHD than for children's services, especially mental health services for children. This type of 'scientifically' legitimated mandate was the basis of the authority which a network's 'boundary-spanners' could exercise over clinicians in the member organisations' hinterlands.

Mandate was a matter of degree. Self-Care Network was mandated to such a slight degree as to make it practically non-mandated, remaining essentially voluntary. Over time other study networks became subject to an accumulation of mandates, which came to dominate their objectives. Reporting an earlier study of cancer networks, Addicott et al. (37) stated:

At the moment, the managed function of these cancer networks represents a novel and distinctive structure that is not present to the same degree in networks in other clinical areas.

(p.96)

Since the data for Addicott's study were collected, however, English cancer networks appear to have lost much of their uniqueness in these respects.

None of the six networks subject to national mandates rejected them. A possible explanation is that all these individuals simply agreed with the mandates. One would expect that attitude to prevail more among managers than other occupations, but it would also be difficult for non-managers to reject the evidence-based components of national mandates about how clinical practice ought to be undertaken. None of our informants rejected the idea of evidence basing and most positively endorsed it.

Furthermore, except in Self-Care Network, the network co-ordinators (the most influential role in the network) were all NHS managers. The same policy mandates as applied to the networks also applied to their member organisations or departments, giving current policy mandates a double salience for them. We nevertheless found that interviewees' knowledge of current DH policy and guidance was at times uneven or incomplete.

The nearest any network came to questioning its mandate, and then a prospective rather than an actual current mandate, was that some members of Urban CHD Network expressed a fear that the network might be used to legitimate cost and service cuts that really arose from implementing the Darzi report. An informant in Small CHD Network, in its days as a care network, thought the Department of Health:

seems to be pushing two messages out at the same time, saying, we should thrombolite them [acute coronary syndrome patients] as early as we can and we should get them in for primary angioplasty as early as we can.

(Ambulance representative, Small CHD Network)

Much as the announcement of PCT merger or reconfiguration was liable to produce planning blight in a network, so could the expectation of national mandates on clinical subjects:

you almost feel like the network has been the intermediary between you know what's happening at national level and what's happening at local level and … rather than going, "Oh well look you know we've just got to wait for the NICE guidelines, we can't do anything until then", it would have been I think more constructive way of looking at it to go, "Well look, what it is we can do within this uncertainty? … Let's have some agreed interim positions for instance".

(PCT public health doctor, Urban CHD Network)

The same informant said that ill-defined guidance was also disabling – it left unclear what bases the network or PCTs were likely to be assessed on. As

an example he cited the unexplained term 'validation' in a recent (2008) target and the measures of NSF target compliance.

In general the mandates were accepted and every effort made to implement them as a duty:

Government policy is a must do and we'd all be foolish to think that isn't the case, so you know, you have to try and – the network has to try and bring those two things together as best they can. So i.e. if we're following Government policy, yes we need to clinically have people on board, but we need to be going in a certain direction which is seemed to be the right way.

(Urban CHD Network, PCT Commissioner)

Indeed there was evidence of targets actually being more than accepted;

they [staff in member organisations] don't see a target as an aspiration, they see a target as a worse case scenario, in the case of something like [the] 18 weeks [hospital waiting time target], so yes, we don't want anybody to wait more than 18 weeks because that's the national target but actually that's the worst we want our patients to wait, and if, its very common now that if the national target says outpatients is 13 weeks now and yet they're working at 3 weeks and seeing that as a problem because its not less than 2 weeks.

(deputy co-ordinator, Small CHD Network)

6.2 Prior networks, mandates and PCT re-organisation

Previously (chapter 5) we mentioned how an 'evolutionary capture' of voluntary networks occurred once a PCT or SHA became network 'host' and co-ordinating body. In greater detail, the usual sequence of events was this:

1. All mandated networks were initially formed either emergently or deliberately.

2. A PCT or SHA became the network co-ordinating body.

3. Re-organisation of PCTs was announced in late 2005. There followed a period of anticipatory 'planning blight' in which PCTs were reluctant to make decisions about networks pending re-organisation of the PCTs themselves.

4. The PCTs themselves were merged and then re-organised. A second hiatus followed whilst managerial posts involved in the networks were re-configured, re-filled or in same cases could not be filled because of the difficulty of attracting applicants to temporary posts.

5. After the PCTs were re-organised, the new management would then review the role and structure of the networks. During this period the new mandate was formulated, adopted by the network and implemented.

6. Children's Hospital Project Network alone experienced an additional step. The Secretary of State's decision about the future clinical service configuration constituted a mandate not only for the network itself but also for its member organisations. It also mandated that existing *ad hoc* working parties and committees be formed into a project network formally charged with implementing this re-profiling project.

7. The other mandated networks emerged as an implementation structure for new policy or managerial mandates (targets, EBM, other guidance). In the care networks the most important effect was to change the networks' function. In practice this meant a shift in membership towards commissioning interests, a larger role for hospitals and a smaller one for primary care, a wider remit and geographical coverage.

8. In all but one (Child Mental Health Network) of the care networks, this re-foundation was accomplished by merging several smaller care networks, each the size of a pre-merger PCT, into a larger network of a size now corresponding to a merged PCT. Child Mental Health Network was exceptional because it continued to operate within a single unmerged PCT. Its membership decreased slightly but the balance still shifted towards stronger commissioner representation.

This transitional period lasted only a couple of months in some of the networks (Children's Hospital Project Network, Child Mental Health Network) but in others considerably longer, approaching 18 months in one (Regional CHD Network). During this time the networks' function and membership changed. Other network activity diminished or ceased. A subsequent sedimentation of additional mandates gradually altered the networks' objectives and activity.

6.3 Mandates and re-organising network structure

New policies for NHS commissioning were the mandates which had the most radical effect on the study networks, changing the function of five of our study networks. This occurred earliest in Urban CHD Network, during 2006-7 in networks, Small CHD Network, City Children's Network, and somewhat later, in the second half of 2008, in Child Mental Health Network. In City Childrens Network:

It's changed though in the last few months. … to become commissioning focussed rather than having everybody round the table at the Children and Young people's board. … And what we've moved to now is a children's trust board which has just got the partners around the table who have a duty to cooperate, which are commissioners … What we decided to do was get to the point where we needed to be clear about what groups needed to be in place to deliver the agenda, the commissioning agenda, and what

arrangements we needed to have in place to network other people in, particularly providers.

(City Children's Network, NHS Chief Operating Officer)

Towards the end of the study period, however, even informants in Urban CHD Network were saying that they were still learning how to operate in a commissioning-based health system.

Concomitantly networks were merged. The direct cause of this was merger of the PCTs which were the geographical and organisational units on which the networks had originally been formed and had provided the managerial 'hosting' for the networks. However the merger of PCTs had, besides the more widely publicised rationale of 'reducing bureaucracy' , a rationale reflecting their more substantial commissioning function; that of strengthening PCTs' negotiating position with providers by increasing the ratio of providers to commissioners. That would increase provider contestability. By the same reasoning, networks covering many providers would be better adapted to 'support' PCTs' commissioning activity. In this context, the most important providers in terms of costs (and political visibility) are secondary not primary care providers.

If it was not the case already, one member organisation became host to the network's managers and infrastructure, and hence the main conduit for new policy mandates into the network. The co-ordinator(s) also became the network member(s) held accountable to higher layers of NHS management for ensuring that the network as a whole was implementing its mandates.

The effects upon network structures of imposing a new or revising an existing mandate depended upon whether the new mandate changed the function of the network. Consequently, although NHS reorganisations impacted upon the structure of the Children's Hospital Project Network project network, the changes in other mandates did not. The organisational structures of both its provider and its PCT member organisations changed, resulting in some changes in the ways in which hospital sites and other providers were grouped and some changes in the top-level managerial personnel. These changes disrupted network activity but, apart from re-grouping some of the member organisations and changing which individuals represented them, had no further lasting effect on the network structures.

Both PCT re-organisation and network re-mandate led to a review of the activities, membership and function of the existing network. During these periods network members tended to assume – often correctly, later events showed – that the reformed member organisations would review what they wanted the network to achieve and what resources they would or could commit to it. Once the member organisations had re-structured themselves, they sometimes (e.g. Small CHD Network) saw the event as an opportunity

to review and re-structure the network itself. What differed between sites was what level the network was then reviewed at, i.e. whether the PCT, SHA or DH took on the role of reviewing the network and making proposals for revising its functions or mode of organisation.

Although the commissioning agencies went through a series of reorganisations there was continuity in terms of the strategic leadership and facilitation in Small CHD Network. Nevertheless even in this network:

as far as motivation goes, I think it's a tough task at the moment, because of the constant changes that are going on, within networks, PCTs, ambulance trusts, it's really disruptive. You know, there are massive changes going on at the moment, and it is difficult.

(Ambulance representative, Small CHD Network)

In Regional CHD Network the hiatus was compounded by the difficulty of recruiting two successive replacement network managers and a period in which senior managers were reported (they did not tell us themselves) to have expressed doubts about the usefulness of networks *per se*. During that time managerial responsibility for sustaining the network passed from PCT to SHA and then, about 18 months later, back to one PCT (responsible for the whole network). The incoming new network manager then faced nine months hard work to rebuild member organisations' confidence in the presence, reliability and value of the network.

In the case of the project network in Children's Hospital Project Network charged with negotiating a very complex re-profiling of hospital services,

from August 2005, we had had a joint committee of PCT teams to represent the then seventeen-PCT population and [then] from the 1st of October 2006 we had to have a new committee, we had to completely start from scratch. As it happened there were some with continuity of membership but that was by happenstance.

(Co-ordinator, Children's Hospital Project Network)

Re-starting its consultation afresh, this time with thirteen PCTs, the network was nevertheless able to decide its re-profiling strategy in December 2006 but three local authority Overview and Scrutiny Committees still objected. An independent review decided 'vision upheld' in August 2007. Thus, although NHS reorganisation had a disruptive effect, this network was able to recover relatively swiftly from it. Indeed, of the study networks it recovered fastest. Elsewhere the usual consequence was a stasis of network activity during this period, which seldom lasted fewer than six months.

The polar case was Regional CHD Network after it was formed by merging two sub-regional CHD collaboratives was hosted at the SHA headquarters. The network co-ordinator post remained unfilled for a period, as did four (i.e. half) of the posts for service improvement managers to support this and a number of other networks. At mid 2008 still no decision had been

made about where the network would be hosted and so the network had to advertise service improvement manager posts in the knowledge that they might be re-located and that they could only offer a short-term contract of employment. These conditions severely restricted network activity.

Even when restructuring was over, policy vacillations in higher-level NHS bodies could still make a network's activity difficult. Thus in Urban CHD Network:

[NHS regional body] is sending, different information [about clinical service models] depending on how at a higher level things are changing all the time, people are just getting fed up with it and just saying well you said something different last week, or you said something different the month before.

(Urban CHD Network, PCT Commissioner)

Usually re-organising network structure, including network mergers, disrupted their internal processes. Restructuring of networks' member organisations disrupted the member organisations' ability to contribute to network activity, for instance through changes in the personnel who attended network activities, including changes of the personnel who played central roles in running the networks (e.g. the network chair, support managers).

Not all networks were disrupted. In City Children's Network no large scale re-organisations occurred after the sea-change of extending network remit and membership from just social services at local authority level to the broader remit of children's services. Despite the positive effect which this winning a grant had on members' morale, the addition of a mandate from NIMHE had no effect at all on the structure of Self-Care Network because the network's overall dependence on this grant was low, and because preparation of the grant application was ancillary to the network's main activities.

Where networks were exposed to restructuring of their member organisations (especially of the co-ordinating body) and of the local health economies, the effects were disruptive in the short term. The disruption was exacerbated by the simultaneous restructuring and mergers of PCTs and, above all, the changes in network function. Restructuring of local health economies and of the organisations within them destabilised the CHD networks especially, and the Child Mental Health Network which was most focussed on care pathways. Member organisations appeared and disappeared, individuals became disillusioned and dropped out. The experience of Regional CHD Network suggests that stability in post of network manager was very important because network co-ordination depends on tacit knowledge, trust and informal links. Unlike their counterparts in bureaucracies, network managers are not readily substitutable person for person. With each re-structuring of the member

organisations, let alone the whole local health economy, network links, trust and culture between network members have had to be re-established.

Often it is assumed that longevity of a network will allow stable links between members to form, which will facilitate the transmission of resources, information etc. through the network and so promote the network's effectiveness. The evidence of the effects of NHS re-organisations suggest an important qualification. This effect only occurs, if the function of the network also remains stable; longevity is therefore necessary but not sufficient for relationality to consolidate. Conversely, as Self-Care Network demonstrated, strong relationality can build up even in relatively short-lived (new) networks based on a common experience and identity of the individual members.

6.4 Additional membership and network performance

6.4.1 Network mergers

The NHS-based networks' main source of additional membership was merger following the mergers of their host PCTs. The main effects of the act of merging upon network structure are described above. Besides them, the policy mandates which caused the mergers had the following effects on network performance.

When networks serve different functions their outcomes, performance and effectiveness are not commensurable, making it logically impossible to say that they changed from being less effective to being more effective (or the opposite) in the same terms. It is nevertheless possible from our data to infer that:

1. The loss or reduced role of primary care members, makes it reasonable to infer that the programme networks became less effective in the task of actually managing (operating) care pathways, especially within primary care.
2. Enlargement also meant that networks acquired a more complex co-ordinating structure and became more complex to manage.
3. In the context of English health policy during the study period, the changing profile of network membership and the increased power of the networks' co-ordinating bodies shifted networks objectives and artefacts towards a commissioning support ('programme') and away for an immediate 'care' function.

6.4.2 Additional providers

The addition of new providers occurred in two of the children's networks (City Children's Network and Child Mental Health Network). It was not, even in the relatively fragmented and disparate third sector, that the networks suddenly discovered providers of which they had been unaware. Rather, existing members (e.g. councillors, in City Children's Network) proposed to involve existing organisations (e.g. Youth Offending Teams) in the network. City Children's Network gained stronger and wider City Council representation (e.g. including the police and more councillors). By adding new care groups to the networks' remit and hence the range of services covered, a wider range of professions became involved. In one of the children's services networks this had a complicating effect, although a necessary one in that some previously marginalised agendas now came to the fore:

one of the issues was whether it was a subcommittee of the city council or whether it's a partnership and at times it behaves as if it's a subcommittee of the council i.e. it's chaired by the council lead and supported by the director for children and social care. Now over the past 12 months we've changed that so that it is actually a partnership body but unfortunately it does still hold … statutory responsibilities that only the city council have, mainly safeguarding and children's trusts.

(Assistant Chief Constable, City Children's Network)

In City Children's Network the contribution which these additional members made to the effectiveness the programme network was in terms of their inputs to the draft service level agreements and making the network aware of the integrated nature of CYP care and development. In both City Children's Network and Child Mental Health Network, managers and non-medical professions were more to the fore in the membership and decision-making.

Child Mental Health Network obtained a two-year grant from central government to set up a new children's centre which soon became one of the main points of referral in the network. For a care network, the addition of new provision, particularly on this relatively large scale, necessarily increased the effectiveness of the network in providing access to services. Whether it increased network effectiveness in therapeutic terms has to remain an open question given the paucity of evidence of what the effective models of care for children with long-term mental health problems are.

For two of the CHD networks an effect of concentrating on the inter-organisation division of labour and the broad flows of patients between providers was to expose the strategic importance of certain less salient service providers. Urban CHD Network and Regional CHD Network prudently added to their co-ordinating body representation of an organisation on which it was most resource-dependent, the ambulance service:

I get the impression that I'm there to sort of put my hand up and say "actually you've done that wrong and that would affect us" and they'll say "oh we have discussed it" but actually [they] haven't. From my point of view it would be a case of "you want to do this but …we can't do that because then we're going to deplete this area of ambulance service cover", so there are confines that you work within.

(Urban CHD Network, Ambulance Operations Manager)

CHD pilot site invested a substantial proportion of its income and activity in strengthening laboratory support for CHD services.

When there was a change from a care to a commissioning network as in the CHD networks, medical members (cardiologists, but also a minority of public health doctors) were, we observed, already important figures in decision-making but now hospital consultant cardiologists became more central and salient to the networks, especially cardiologists who were also medical directors. In becoming commissioning networks, the CHD networks created another route by which doctors could influence, indeed enter, NHS managerial activity.

Despite central policy support for increasing the commercial provision of NHS services, the growing numbers of them contracted to the NHS and the fact that commercial health care providers are relatively heavily concentrated in the territories served by two of our CHD networks (Urban CHD Network, Regional CHD Network), none of the study networks recruited any commercial healthcare providers as organisation-members of the networks although the development of care pathways in Urban CHD Network was evidently of interest to pharmaceutical companies:

A lot of pharmaceutical companies have contacted me to find out if we're coming up with guidelines, network guidelines that might mention their products in there. And obviously I'm very cautious about our involvement in that but I see no reason why we can't open dialogue as long as we speak equally the same, you know, treat all of the companies in the same way. … We obviously are committed to following NICE guidelines so we wouldn't be particularly recommending a product from one or other company anyway.

(Urban CHD Network, Assistant Network Director)

In this respect mandating the networks made no difference to their performance. One might infer that this is because, as independent providers, such organisations are under no obligation to participate. Neither, however, are third sector providers, yet these did participate in the children's networks in City Children's Network and Child Mental Health Network, indeed making up a around a third of the member organisations in the latter.

The merged networks increased in terms of numbers of members due to the greater numbers of organisations and wider geographical coverage. One effect was to produce a potentially unmanageably large network (reported in Urban CHD Network). At the same time, a shift towards a commissioning

support function meant that the commissioner representatives became the links into the networks' (new) core process (of commissioning) rather than the provider, especially primary care, members. For this reason, although it also incidentally solved the problem of unwieldiness, the network co-ordinating bodies tended to get smaller not larger as a result of the network mergers. In Urban CHD Network for example, and in City Children's Network, Board members tended to equate the board members with the network, selectively adding other members *ad hoc* for specific tasks. Hence another effect of growth was to make the definition of network membership less clear at the periphery:

it was just passed over to me as something that I should be part of, you know like I was given the e-mail.

(Director of Public Health, Urban CHD Network)

Our Director's good for that she'll say "I heard this ...." or "I was reading ...." whatever, some new trial, shall we look into it, you know. There's one at the minute, there's a percutaneous valve replacement on the clinical side of things, a new way of doing valves in surgery, so we're kind of like going to look into that – that's a new service, how's it going to be commissioned, what's going to happen?

(City Children's Network, Commissioning Development Manager)

Some but not all governance mechanisms changed. With the shift in focus described above, there was much less scope for practical reciprocal help-in-kind of the sort found in localised care networks. Instead, the enlarged networks relied more on issuing guidance, prominently including evidence-based guidance and guidelines for clinical practice (a quasi-hierarchical mechanism (198). Increasingly normalised managerial activities became necessary for co-ordinating the network (which is slight support for hypothesis H2E).

6.5 Summary

Prior social and professional networks influence affected the operation of a new mandated network by providing the initial membership and ties together with implicit objectives. However, the networks' response to mandate served to transform an emergent structure serving its founder-members' interests into an implementation structure. As time elapsed an accretion of mandates resulted in new, stronger external accountability chains, in the formalisation and normalisation of working practices, and the development of a co-ordinating body with secretariat ('network administrative organisation'); in short, in a managerialisation of the networks. Networks acquired multiple functions sedimented within each. Prior voluntary networks persisted within subsequently-mandated networks (as H2D hypothesised) but as contributing only part – and a decreasing

proportion – of the networks' accumulating objectives, activities and artefacts.

Our hypothesis (H2B) that mandated networks are 'enclaves' in the sense of having a formally defined and closed membership was also supported. Membership of mandated networks was by invitation from the co-ordinating body, on the basis of relevance to the network's mandates. Conversely, Child Mental Health Network excluded those not deemed relevant once it became mandated. In respect of our hypothesis (H2A) that mandated networks would include involuntary members, we found little supporting evidence. Uninterested or inconveniently critical people dropped out – sometime acrimoniously – or were never recruited. Representatives of member organisations instead appeared uniformly to be voluntary recruits. Contrary to our prediction, opposition was by exit (although with some 'voice' beforehand).

7 Participation

Here we sought to ascertain:

> RQ3a: What determines the way in which member organisations use relational co-ordination structures?
>
> RQ3b: What determines the effectiveness of member organisations' use of these structures?

We constructed the following hypotheses for the SNA :

> H3A: Network nodes (individuals, organisations) with more extensive network links have greater propensity to engage in innovative activity (because they have more sources of external ideas and feedback).
>
> H3B: Organisations whose internal culture is more favourable to collaboration will have more extensive network links (because that culture also favours inter-organisational collaboration).

We interpreted the phrase 'use relational co-ordination structures' as meaning 'participate in the networks'; and 'effectiveness of … use' as meaning 'use the networks to promote innovation and influence referrals'. Our findings on the links between performance (as defined above) and participation in the networks are reported in chapter 12 so here we focus on innovation-related activity and upon service users' (patients', carers') participation in the networks.

7.1 Patterns of participation

In general at the inter-organisational (node) level, network member organisations were highly connected to each other. In every network, ego densities (that is, the proportion of theoretically available links which each member organisation actually reported having) were high. Measures ranged from 52% to 100%. Thus every member reported direct links, on at least one level of interaction (patient referrals, help-in-kind etc.), to at least half the other network members. Even for the least connected network (Urban CHD Network), the mean ego density score was 0.76. Another measure of this high degree of connectedness was that nodes' reach centrality scores were all high (ranging from 0.66 to 1.00, the maximum possible).

Mostly network members had direct links with each other, not via intermediaries. Because of the high proportion of directly-linked nodes, nodes' normalised brokerage scores were conversely low (range 0 to 0.24 across all the networks) because a brokerage role relies on the 'broker'

acting as intermediary between other network members who would not otherwise be linked.

Many people whom network co-ordinators had identified as network members nevertheless did not see themselves as such, even though they were reported, or even reported themselves, as active network members. Although our survey questionnaire explained that responses even from people who did not consider themselves network members would be useful to us, a number of respondents sent messages saying that they would not respond because they considered that they were not network members (Table 6). As has also been reported of Australian networks (2) it was noticeable how variable, and generally slight, general practice participation in network structures was, considering the number of general practices and the importance of primary care for both CHD and children's' services. The great majority of general practices were only passively involved (as recipients of guidance etc.) At the opposite pole were GPs who had been founders and leading figures in local networks (Child Mental Health Network, Regional CHD Network). Other classes of organisation were likewise eligible to participate in some networks but only a few of them actually did. Thus, in Child Mental Health Network only a few nurseries or school nurses were in contact with the network although in theory all of them were eligible to be. In these categories were large numbers of organisations all with a legitimate claim to participate, if they wished, in the networks; but the networks' activity was rather marginal to their own and no intermediary mechanism existed whereby one representative of one such organisation could attend (say, by rota) to represent the whole category.

In Self-Care Network participation in network events was the criterion of membership. Members' levels of participation varied, above all when individuals had recurrences of their mental health problems but also for simple practical reasons such as whether bus services operated punctually (or at all) or whether friends could give them a lift to network events. There was clearly a kernel of volunteers, service users and professionals organising Self-Care Network events but membership of the Self-Care Network was blurred between those running it and those attending its events.

Organisations' participation in Child Mental Health Network appeared to depend partly upon how interested their representative happened to be and upon case-load exigencies for the practitioners, but also upon how central the network's activities were to that member's own work and interests. Thus, social services and health visitor representatives attended regularly, as did CAMHS members and, latterly, PCT commissioning managers, but GPs rarely. Attendance, however, did not always mean convergence of interests:

at the end of the day we are organisations with sometimes conflicting objectives. You know, our [police] objective is in relation to crime reduction [...] but we accept that other people have got different objectives and views on things. For example do we work with a health trust in order to provide or to ensure the provision of sexual health support to young prostitutes sometimes or do we take the view that actually it's more important to work with the community and try to remove the obvious presence of prostitutes? [...] we've got different objectives and we try and help each other to achieve our respective ones.

(Assistant Chief Constable, City Children's Network)

In Regional CHD and Small CHD Networks participation also seemed to depend on its likely impact upon the member's work. Against the odds given their heavy clinical and managerial responsibilities, two leading cardiologists participated actively because they believed the network would influence both the referral flows and the profile (location, specialisations, and capacity) of their own hospital cardiology services. A pattern of participation among Urban CHD Network member organisations was that they would, so to speak, drop into the network when they wanted something from it (e.g. advice on a proposed service development) and then somewhat drop out again. Cardiologists had greater input and influence in the CHD network activities than their relatively small numbers would suggest, making a predictably large contribution to producing the technical guidance which was the main co-ordination artefact for these networks. The clinical leads for these networks were all hospital cardiologists. In terms of occupational groups, the most numerous active members in many of the networks (Child Mental Health Network, Urban CHD Network, Children's Hospital Project Network, Small CHD Network) had a nursing background, often either as nurse specialists or nurse managers. The organisations (PCTs, in every case except Regional CHD Network and Self-Care Network) which hosted the co-ordinating bodies made the largest practical contribution to co-ordinating the networks.

7.2 Innovation through participation

We hypothesised (H3A) that member organisations which participated more fully in networks, in the sense of having connections to a greater number of other network member organisations, would therefore undertake more innovation-related activity. From the ten survey fields about participation in innovatory activities, we assembled a score (one point for each activity ticked). These scores reflected participation in the activities characteristic of the development and implementation of evidence-based based medicine. These were: feedback about changed care processes before they were fully implemented; talking to health professionals outside one's own organisation about care processes; reviewing research for new ideas; participating in committees outside one's own organisation that are working on care

processes; seeking data that compares different organisations' performance of my organisation'; pilot projects; Plan-Do-Check-Act or similar quality improvement audits; site visits to other organisations. For short we call them 'innovation-related activities'. This is a narrower concept than the more widely-used concept of 'innovation' (199).

Network by network, we tested member organisations' innovation related activity scores for association with the organisation's connectivity characteristics of network nodes (ego density; degree; reach; betweenness; flow betweenness) and for association with the nodes' E-I indices (Table 9). (Correlation scores range from 1.0 (perfect correlation) to 0.0 (no correlation) to -1.0 (perfect correlation between increased innovation and decreased connectivity)).

Table 9. Correlations between Innovation-related activities and links within the networks

	Correlation (Spearman's rho) between innovation scores and:				
	Degree	**Degree centrality**	**Reach centrality**	**Betweenness centrality**	**Flow Betweenness centrality**
Small CHD Network	0.15	0.13	0.15	0.12	0.13
Self-Care Network	-0.38	-0.08	-0.38	-0.44	-0.56
Children's Hospital Project Network	-0.37	-0.05	-0.422*	-0.34	-0.17
Urban CHD Network	0.674*	0.69*	0.67*	0.67*	0.69*
Child Mental Health Network	0.17	0.26	0.17	0.14	0.29

** = Significant at alpha=0.05.*

The findings for Self-Care Network have to be interpreted very cautiously. Innovation related activities were relatively few in Self-Care Network because of the absence of, indeed very limited scope for, formal evidence-basing. For example there was no possible equivalent to clinical audit in that network. They had no equivalent of a professional or scientific literature to draw upon. However Self-Care Network members could visit other organisations to discover good practices. They could also discuss among themselves and pilot new ways of promoting the physical health of adults with long-term mental health problems. *A priori* one would therefore expect the scores for innovation-related activity, as defined above, to be lower in Self-Care Network. In the case of Self-Care Network, the scores mostly

express the responses of private individuals rather than the representatives of organisations.

For internal links, innovation activities were consistently significantly associated with connectedness in only one network (Urban CHD Network), albeit the largest. This pattern is as reported in studies (96,200) of networks outside the health sector. In our other study networks, though, no significant association was found (except for reach centrality in one network, and that was a negative correlation). This pattern suggests that the association between innovation activities and network connectedness applies only under specific conditions, found in Urban CHD Network and not the other study networks. As explanatory conditions we eliminated:

- Care group served (lack of correlation was found in one CHD and one children's services network)
- State of development of evidence-based practice. Granted evidence based practice is poorly developed for children's mental health services (Stenhouse et al, submitted) and for physical self-care for adults with mental health problems, but the same does not apply to acute care for children (Children's Hospital Project Network).
- Network function (lack of correlation was found in programme networks and the project network)
- Network density. Although Urban CHD Network was less dense than the others, all the study networks were relatively dense (see above)
- Non-hierarchical structure. As explained in the following chapter, all the networks scored low in terms of the formal (Krackhardt GTD or Burt) measures of hierarchy.
- Mandate; the lack of correlation was found in both voluntary and mandated networks.
- Network size. The correlation between connectivity and innovation was found in one of the two largest networks (in terms of population and territory covered), but not in Children's Hospital Project Network which served a similar population and had a greater number of member organisations.
- Occupations: there was no consistent pattern of occupational difference between Urban CHD Network and the others.
- Preponderance of NHS member organisations.

A possible explanation arises from the combination of two factors. The network co-ordinating body had relatively low centrality in Children's Hospital Project Network; and the CHD networks' mandates included or

implied various innovation-related activities. So, more in this network than the others, member organisations relied on each other and not just the co-ordinating body as a source of evidence about clinical practice. This inference however requires further research to substantiate. Where the above associations do exist, it remains an unanswered question whether a higher degree of intra-network connectedness helps promote innovation-making activity; or *vice-versa* with innovative activity stimulating linkage with other network member organisations.

By repeating the above analyses but substituting E-I indices for measures of connectedness within the network we were able to test the analogous hypothesis about external connectivity. Table 10 shows the results.

Table 10. Innovation-related activities and links outside the network

	Correlation (Spearman's rho) between innovation scores and E-I index
Small CHD Network	0.40
Self-Care Network	-0.56
Children's Hospital Project Network	-0.466*
Urban CHD Network	-0.606*
Child Mental Health Network	0.35

** = Significant at alpha=0.05.*

Two networks had a strong and significant correlation between external linkage and innovation activities. The others did not. The association was found in one CHD network, indeed the same network that showed the association between innovation and internal connectedness; and one children's network. Contrary to what studies in other networks report (see above), however, that correlation was negative.

Given our qualitative data, we speculate that the negative correlation between innovation-related activity and external links appeared for the following reasons. Policy guidance at the time stipulated various service standards (e.g. those in the NSFs) and EBM-related activities. Innovation-related activity of the (mandated) networks consisted in implementing these policies rather than inventing new processes of care. Through their co-ordinating bodies (SHA or PCT) the networks in which the negative correlation appeared were mandated to implement these policies and guidelines through the network. Thus, the more closely connected a member organisation was to the rest of the network and the fewer links

outside the network it had, the more it partook of innovation-related activities of the types demanded by policy and national clinical guidelines at the time.

In summary, connectedness within one of the largest networks was significantly positively associated, and in two of the largest networks external connectedness was negatively associated, with innovation-related activity. But in the other three smaller networks, there was simply no association between connectedness and innovation-related activity.

7.3 Culture, collaboration and participation

In order to look at the relationship between collaboration and the culture in the network, we hypothesised (H3B) that member organisations with a more favourable culture would also have denser network links. This analysis treated the questionnaire data as the responses of individuals rather than of the organisations which those individuals represented in the network. Organisational 'culture' was defined in terms of individuals' confidence in their colleagues respect and willingness to discuss difficult questions constructively; and in terms of willingness to work alongside their present colleagues. Organisation culture was expressly defined as an attribute of the respondent's home organisation, not as an attribute of the network as a whole.

Nodes' (organisations') culture scores were higher for the two children's than for the two CHD networks. The user-experience network's culture score was nearer that of the CHD than the children's networks. Using similar methods as for H3A we tested node culture scores for correlation with the connectivity for each node. Table 11 shows that no statistically significant correlations were found although some of the coefficients have high (but negative) values.

Table 11. Correlations (Spearmans rho) between culture and connectivity

	E-I index	Degree	Degree centrality	Reach centrality	Between-ness centrality	Flow Betweenness centrality
Small CHD Network	0.95	-0.82	-0.63	-0.82	-0.63	-0.63
Self-Care Network	-0.56	-0.73	-0.05	-0.73	-0.73	-0.15
Children's Hospital	-0.02	-0.02	0.00	-0.09	-0.15	-0.15

Project Network						
Urban CHD Network	-0.20	-0.44	-0.30	0.17	-0.13	-0.04
Child Mental Health Network	0.22	-0.28	-0.14	-0.62	-0.02	-0.06

None significant at alpha=0.05

Table 11 shows a general absence, in the networks studied, of significant correlations between culture within the member organisations and the extent of their connectivity to other organisations within the network. A similar absence of significant correlation between between culture and connectivity to organisations outside the network was found in all the study networks.

Provided that they are not a measurement artefact (the instruments have previously been applied in the USA but not, so far as we know, in the UK), these findings consistently tell against the hypothesis (H3B) that member organisations whose internal culture is more favourable to collaboration will also have denser network links. Neither, therefore, is there evidence that closer participation in the network improves the internal culture of the member organisations.

Our qualitative data analysis did however suggest that culture within the network influenced members' willingness to participate. Climate within the network depended upon how members perceived the other network members treated them; that is upon the quality of network 'relationality'. Indeed the quality of network relationality influenced whether members participated constructively or the opposite:

we had a very bad meeting where we [primary care members] all turned up from our [sub-]network to see what was going on and we were really badly treated. I stood up and they [regional cardiology centre representatives] all said, "Right we're going to launch it [a new service plan], right we're going to do this". And I said, "But have you discussed it with the PCTs and the primary care and what was the primary care involvement?" And they just basically told me to shut up and they didn't care. So I went and scuppered the whole thing (laughs). I went home and shouted at a few primary care people and stopped it happening.

(GP lead for a member PCT, Regional CHD Network)

This GP had been a leading, indeed founder, member of one of the local CHD networks which merged to form Regional CHD Network. She and

several others left the network, as did the former network co-ordinator in the Child Mental Health Network when it became mandated. These events tell against hypothesis H2A. Although revealing, these conflicts were exceptional. City Children's Network had an opposite atmosphere of explicit inclusiveness based on an interpretation of Children's Services so broad that such a service as Youth Offending still regarded itself as part of the network even though the manager did not have a place on the Board:

Oh I've been … head of service for about three years … I was a member of the operational management group that reported to the board but because of how busy we are … I'm involved in a range of partnerships. So therefore it wasn't always essential that I attended and I was sort of more focussed on our own youth offending service management board which has the chief exec of the PCT, senior police, senior probation officers and is represented on the Trust Board.

(City Children's Network, Head of Youth Offending)

As described in the following chapter, this network was one in which the different views and interests of member organisations were recognised and mutually accommodated.

7.4 Service user participation

Service user involvement in voluntary networks is, we hypothesised (H3C) more extensive but uneven than in mandated networks. Mandates produced public and patient participation in the six NHS networks, but the effects were limited. In the NHS networks, lay participation, although almost always described to us as desirable and necessary, was equally often added on to the network once its main membership and function were established. The two usual mechanisms were to add a lay advisory sub-group (e.g. CHD pilot site); or to recruit lay members to existing network bodies, either permanently or to participate in once-off events such as local conferences (e.g. Child Mental Health Network). In some cases these were individuals already active as, and in that sense accredited as, 'lay representatives' in other nearby NHS bodies (CHD pilot site).

Child Mental Health Network had few systematic methods for patient or public involvement. Some open meetings had been held, but with poor attendance, especially in the more deprived parts of the city. There were no systematic user surveys. Clients and patients were however encouraged to attend, indeed co-present sessions with staff, at open days for the new children's centre.

The main means for public involvement in CHD pilot site were talks, organised through the patient involvement group, to 'educate' patient representatives (e.g. about infection control). CHD pilot site also set up a patient participation group with 14 members with a part-time co-ordinator.

The most energetic and influential patient representative was active in a number of other NHS bodies intended for patient involvement, indeed recruited from one of them. NHS-employed network members were interested in the lay representatives' comments but there was a mismatch of focus. The lay members were (not surprisingly) most inclined to comment on details of service provision – car parking at one hospital site, hospital food - but it was harder to sustain dialogue about the more general aspects of CHD services, the main concern of this programme network. In that respect Child Mental Health Network had better success but it was a care network still interested in just such details. Its activities included open days for the public, clients and any interested local residents at its new children's centre. So far as we could tell, Regional CHD Network had little public involvement.

The Heart Support Group in Urban CHD Network was very active. One of its key organisers was a cardiac rehabilitation specialist nurse who acted as a patient conduit for issues raised at the group. Urban CHD Network also ran patient reference groups including users from all trusts in the network:

one thing that you know [is] that the network meetings there's always some interesting feedback from patient groups. The tricky thing is, again it's this kind of getting representation across all the PCTs, so you know we get feedback from someone from, who's had experience in a trust which is not in our area for instance. But those links are good, you know, I think it's really good to have that kind of feedback.

(PCT public health doctor, Urban CHD Network)

Patient representatives were generally given a slot on the network meeting agendas.

Children's Hospital Project Network had a 'very vocal' public partnership board (PPB) which was a sub-board of the Network Supervisory Board and chaired by representative of a voluntary organisation. Proposals for re-profiling children's services had been intermittently reported in the local press for many years and had at times become controversial. As its plans matured, the Children's Hospital Project Network embarked during 2006 on an extensive public consultation, which its co-ordinators described as 'the biggest thing the NHS has ever seen'. Over a period of 16 weeks it had involved over 800 public meetings and elicited 55,000 responses in total, representing some 250,000 people. An external consultancy processed the responses and its report presented a total of 13 options for service configuration, including the five originally proposed by the network.

Small CHD Network was (as described above) nested in a wider cardiac network, which did much of the patient consultation and involvement work for it. Such patient participation as occurred did so at sub-group rather than whole-network level.

Patient and public involvement, in terms of participation in both decision-making (and of course proportion of active individual network members) and undertaking the network's core activity, in the non-mandated user-controlled Self-Care Network far exceeded that in all the mandated NHS networks. Appendix 8 itemises the new self-care activity which the patient members of user experience network developed, showing how this contrasted with the other networks. The difference was both in the proportion of network activity that user-members contributed and the nature of their contribution, which included actively participating in, indeed organising, exercise and social events besides more passively undergoing 'education'. In the other voluntary network (Child Mental Health Network), some individual users played an active and influential role, but the most influential of these was a former nurse who had previously been active in the network in her professional capacity. They participated in committees as individuals by invitation; we found no structures for patient involvement. User participation in the mandated networks appeared to occur in much the same ways as in NHS organisations such as PCTs, and with similar (i.e. limited) effects. The contrast between the experience network (Self-Care Network) and the mandated networks supports the hypothesis (H3C) that service user involvement in voluntary networks is more extensive in mandated networks; but the contrast between Child Mental Health Network and the mandated networks suggests the opposite. The hypothesis that user participation would be more uneven in voluntary than mandated networks thus gains some support from this study, raising the question of what factors therefore promote patient involvement.

7.5 Summary

We conclude that what determined the extent and ways that members used (participated in) the study networks were:

- *Convergence* between member organisation's own prior objectives and incentives, and the network activity i.e. network participation is a way to secure prior objectives of the member organisation (which might include the avoidance of sanctions).
- *Salience (strategic importance) of the network's activities* or policies to the member organisation.
- *Experience of the inter-personal quality and practical value* of network activities for the individual participants.
- *The presence or absence of mediating bodies* to represent numerous, fragmented organisations for whom the network activities have relevance and value, but not preponderantly among their interests.

- Its *point of contact with the network*. A member organisation whose point of contact was the network co-ordinator(s) were at an obvious advantage in influencing the network agenda, keeping informed of its activities, and routing information and resources to the other members.

How far a member organisation effectively influenced ('used') the network appeared in our study sites to depend upon that organisation:

- *Having a key role in the network's core activity*. This factor gave the cardiologists their powerful role in Regional CHD Network and CHD pilot site; obtained for the ambulance trust an invitation to join the board of Urban CHD Network and in Child Mental Health Network an influential role to midwives and social workers (because they were important sources of referrals into the network's care pathways.

- *Participating in network co-ordination.* Because evidence-based medicine played a large role in network co-ordination (as the next chapter explains), the members who could produce it were in a strong position to influence network decisions and policies. Although not always the most central member organisation in a structural sense, the organisations which hosted (e.g. employed) the network co-ordinators naturally exercised considerable influence over the network agendas, decision-making process and subsequent implementation activity, although always by agreement with the rest of the network board.

8 Coordination

Our research question about co-ordination was:

RQ4: What types of co-ordination processes mediate the above effects?

We constructed the following hypotheses to test by social network analysis :

H4A: Government intends PCTs to co-ordinate mandated networks. Hence:

1. PCT members of networks will have the highest brokerage scores

and;

2. hierarchical reduction will show PCTs as the topmost member of any hierarchical relationships present.

H4B: Mandated networks, compared with voluntary networks, are structured with:

1. More 'hierarchical' in the sense of having public organisation as a core body; and hence a tendency to 'vertical' control (from core to other members) implying:
2. low density
3. flow is mainly from core to periphery
4. relatively consistent separation (all members relate directly to the core, and to each other mainly via the core)

H4C: Voluntary networks will have more relational, trust-based internal co-ordination and roles than mandated networks.

And for the qualitative analysis we hypothesised:

H4D: Voluntary networks have negotiated allocation of roles.

H4E: Voluntary networks deal with conflicts by exit, mandated ones by negotiation and voice. Power distribution is more fluid and shifting in the voluntary network. In mandated networks, because exit is not possible, oppositional activities occur, both passive (self-isolation, non-compliance) and active.

H4F: Mandated networks show uniformity and formalisation of organisational processes and flows than voluntary networks do.

8.1 Organising structures

Since networks can (and did) operate for many years through 'emergent' collaboration, the question arises of whether deliberate management of them added to their effectiveness ? The informants whom we interviewed expressed no doubts that deliberate management made the networks more effective. All the networks had some form of formal organising structure and concomitant appointment and accountability mechanisms. The key structuring mechanism was the use of a 'board' or 'steering group' (the name varied) and a management infrastructure.

It was not surprising that the user-experience network in Self-Care Network had the least formal organising structure. Every month or so it held a meeting, which any member could attend and speak to. There the network's activities were planned or reported on, with any ancillary matters such as fund-raising. Outside people were sometimes invited e.g. a supportive local GP, a community psychiatric nurse and (most often) a PCT public health worker. Although the atmosphere and discussions were informal, written agendas, minutes, correspondence and accounts were kept. Other documents such as funding applications and the subsequent reports, including one evaluation, were also produced.

Because City Children's Network was a strategic partnership network, it consciously modelled its organising structures on those of similar large-scale partnerships:

Most of the partnerships for example have got a partnership director which is joint funded in some way and we've been agitating to have that for the children and young people's partnership board and we're getting there. We've got a smaller executive group now that meets on a regular basis as opposed to I told you, we dropped the 40 strong board and got down to about 20. But even that's too big to exercise a sort of managerial direction really.

(PCT Chief Executive, City Children's Network)

Whilst Child Mental Health Network remained a care network, it also had a steering group conducted on similar lines to Self-Care Network. As time passed its active membership widened with nurses in particular participating more fully. Small CHD Network also had a network wide co-ordinating group. Urban CHD Network was formally constituted with a Board, Chief Executive and Chair. Initially City Children's Network had a large number of sub-groups but by the end of the study period had culled them down to a set of subgroups focussing on specific activities of interests e.g. voluntary sector providers.

All the enlarged networks except Self-Care Network set up sub-groups accountable to the main steering group to undertake particular aspects of their work. Often these groups had a life-time limited to completion of their

allotted task but CHD pilot site set up a permanent sub-committee of user representatives. Both the local CHD network in Small CHD Network and the sub-regional network in which it was nested were organised using a structure of a respective steering group and then sub groups. The sub groups would address specific issues. In Small CHD Network,

each [of] the sub groups were formed out of identified need, and then each sub group was tasked with going away and doing a review of the current provision of service.

(Deputy co-ordinator, Small CHD Network)

These subgroups might meet only once or twice, or more often depending on the complexity of their task and whether they were required only to review a service, or to implement changes as well. In Small CHD Network the heart failure sub-group then subdivided into four sub-sub-groups to undertake more specific reviews (of diagnosis; acute care; discharge; and ongoing management).

We also found this pattern in networks Child Mental Health Network, Regional CHD Network and CHD pilot site. Indeed, in Urban CHD Network the sub-networks did most of the network's work about:

Things like policy and pathways so we've now got them working on a whole range of pathways. We've had a couple of individual people working on a transfer policy, working with the ambulance services to develop that. So it's those kinds of overarching policies and procedures that they're working on at the minute.

(Co-ordinator, Urban CHD Network)

Urban CHD Network had a designated managerial support team with clearly designated roles.

From 2003, when its remit, widened Children's Hospital Project Network acquired sub-groups for paediatrics, CAHMS, obstetrics and neonates. The SHA was responsible for overseeing the network's work, but the network's sub-groups actually decided the details of the re-profiling of children's services:

for example the Paediatric [Sub-]Network has got a programme of work which involves doing things like looking at day surgery and therefore then the links into anaesthetics and what that means for children, things around ambulatory care and A&E services.

(Deputy co-ordinator, site B)

Here as elsewhere the membership of these sub-groups was fluid, changing according to the task in hand. The larger CHD networks (Urban CHD Network, CHD pilot site) also made temporary *ad hoc* recruitments to advise and assist the network in dealing with a specific technical problem e.g. technicians advising on the shortage of laboratory technicians for CHD services and on the exact ways in which technicians could contribute to the development of local CHD services (CHD pilot site), or commissioning public

health studies (Urban CHD Network). The larger the network, the more the co-ordinating group and the sub groups differed in membership.

As care networks changed into programme networks they experienced a corresponding change in the membership of their co-ordinating body. The original steering groups were, paradoxically, replaced with smaller ones in which hospital consultants and senior PCT managers (often the commissioning lead, sometimes the chief executive) played a larger, and primary care clinicians a proportionately smaller, role than previously. When PCTs merged, the networks based on them were also merged, as were the parallel sub-groups which in each of the earlier, separate PCT-wide networks had dealt with the same issue (e.g. heart failure, thrombolysis).

Consequently the common structure of the co-ordinating body in each NHS network was with a central steering group having sub-groups accountable to the network's co-ordinating body. Members of the Small CHD Network local network commented that the well-organised nature of the steering group and its sub groups was important in signalling to new and existing members that this was a focused, reliable and well-led network which made concrete progress to visible, clear goals.

8.1.1 Management infrastructure

Each NHS network had a variety of co-ordinating managers. In Child Mental Health Network the first co-ordinator was a CAMHS manager. Her successor was a PCT commissioning manager who was line-managed accordingly, although for network activities she was also accountable to a joint PCT-City Council Partnership for Children and Young People. In Regional CHD Network the co-ordinators were employed by the SHA and part of the hierarchy ultimately line-managed by its CEO. More often than not the non-co-ordinator members of networks represented other organisations. The Chief Officer and Clinical Director of CHD pilot site were accountable to the lead PCT's Chief Executive. Network co-ordinators were thus appointed by the SHA (Regional CHD Network, Children's Hospital Project Network) or PCTs (Pilot Site CHD Network, Small CHD Network) or PCT and local government (Child Mental Health Network, City Children's Network). These co-ordinators were therefore accountable through line-management to a member, indeed the network's host, organisation and so in the last analysis accountable to it, not to the network as a whole. The exception was in the project network at Children's Hospital Project Network whose co-ordinators were accountable to an over-arching network supervisory board. The SHA appointed the Chair of a member-PCT as the chair of the Children's Hospital Project Network project network . The network co-ordinators were employed by the city's PCT but also accountable to the network board.

The co-ordinators of the non-NHS network Self-Care Network were volunteers accountable only to the other network members although there was no clear cut-mechanism for enforcing this accountability.

The experience of Regional CHD Network made clear how necessary a co-ordinator ('network manager') is for a large, dispersed network. During a period of many months until mid-2008 this network lacked a manager and service improvement managers, resulting in 'inertia and ambiguity' so that the incoming network manager's first necessary response was that:

I did go round and made sure I went to hospitals … and to commissioners … I did spend quite a lot of time getting people together, getting them together in groups to rebuild.

(Co-ordinator, Regional CHD Network)

The combination of changes in post-holders and restructuring of member organisations, together with mergers and changes in network function, disrupted membership lists. Network Regional CHD Network only belatedly produced one for the researchers although it clearly possessed circulation lists. Indeed during one of the hand-overs between successive co-ordinators in Regional CHD Network the outgoing co-ordinator's computer was wiped clean of all data including mailing, distribution and membership lists. To that extent what one might have imagined were basic requirements for organising a network were absent. Child Mental Health Network, Small CHD Network and Self-Care Network had no such problems, although by causing changes in post-holders NHS restructuring also disrupted the Children's Hospital Project Network.

Two study networks were nested in one or both of two kinds of wider network. Urban CHD Network had very active and regular engagement with the national network co-ordinator for cardio-vascular services. Small CHD Network was a local CHD network nested within a sub-regional CHD network also tasked with introducing the NSF. There was a division of labour between the local and the sub-regional networks, and sharing of ideas and resources, but this did not amount to one network being formally accountable to the other. Network Urban CHD Network was accountable, via its co-ordinator to the Heart Improvement Team at the Department of Health, sending regular reports on participation in the network.

In every case, even the user-led Self-Care Network, there was considerable formalisation of decision making processes in the sense of recording and documentation in standard forms. During the study period, one of the member organisations began paying the most active of the Self-Care Network co-ordinators to work full-time.

Becoming several times larger appeared to reinforce the merged networks' (City Children's Network, Small CHD Network, Regional CHD Network) tendency to adopt formalised NHS styles of management practice such as

the use of fixed-term ('task-and-complete') working groups. A shift in function from care network to commissioning support also necessitated more extensive and varied managerial input to the network. The concurrent move towards the commissioning of care networks (as providers) had much the same effect even in the non-mandated user-experience Self-Care Network, which sought advice from its local PCT about how to set about obtaining 'mainstream' funding through the commissioning system. Because that network had predominantly lay membership, the addition of managerial and professional language and culture into the meetings was more noticeable than in the other networks. To that extent, we found some support for our hypotheses (H2F, H4F) that mandated networks show uniform and formal organisational processes and flows than voluntary networks do.

8.2 Centralisation

In order to co-ordinate the rest of the network, a network's co-ordinating body would have to be central to the network, linked to all the other network members and able to act as an intermediary between them.

Table 12 shows how the network co-ordinating body ranked, in terms of its centrality on five measures, against the other members of its network. 'Degree centrality' expresses the number of links each member organisation has to others in its network. Betweenness centrality expresses the extent to which an organisation lies on the path of links connecting other member organisations. The Freeman measure expresses how closely each member organisation comes to being the hub in a 'hub-and-spoke' structure. Reach centrality expresses what proportion of other network members each network member is directly linked to (rather than linked to via intermediaries). Flow centrality expresses the extent to which each network member is one the shortest set of links between the other network members. An entry such as '2/6' means that the co-ordinating body was ranked second highest out of six network members in terms of the measure shown at the top of the column. An equals sign means that the co-ordinating body held this rank jointly with one or more other member organisations.

Overall the pattern is that the co-ordinating body was generally in the top half of its network's organisations in terms of centrality on these measures, but in the NHS networks not generally the most central. Paradoxically the only co-ordinating bodies ever ranked first in centrality were those of the two small voluntary networks. So the networks were closely co-ordinated in the sense of being very dense (see previous chapter) rather than in the sense of being strongly centralised on the co-ordinating body alone.

Table 12. Centrality of co-ordinating bodies: rank within network

	Degree centrality	Ego between-ness centrality	Flow Betweenness Centrality	Freeman Between-ness Centrality	Reach Centrality
Small CHD Network	2/6	1=/6	2/6	2/6	1=/6
Self-Care Network	4/8	1=/8	3/8	1=/8	1=/8
Children's Hospital Project Network	6=/23	2/23	5/23	7/23	5/23
Urban CHD Network	7/14	8/14	6/14	14/14	8=/14
Child Mental Health Network	3/31	2/31	/31	6/31	5=/31

We hypothesised (H4Aa) that the network's co-ordinating body would have the highest brokerage scores of the member organisations. Its brokerage score expresses how often a node is an intermediary between two other network members which are directly connected to it but not directly connected to each other. Table 13 shows brokerage scores in normalised form (as percentages not as raw scores, so as to abstract from the different sizes of the networks). The higher the brokerage score, the more the organisation fills the role of broker (intermediary) between other network members. This and subsequent analyses treat informants (nodes) as representatives of organisations. As before, multiple entries in cells in table 13 indicate tied results.

Table 13. Brokerage scores and roles

Normalised brokerage scores	Small CHD Network	Self-Care Network	Children's Hospital Project Network	Urban CHD Network	Child Mental Health Network
Mean for network	0.05	0.05	0.06	0.12	0.08
Range	0.00-0.1	0.00-0.05	0.02-0.14	0.00-0.24	0.00-0.18
Co-ordinating body	0.1	0.05	0.1	0	0.18
1st highest	PCT (co-	Co-	Local	Co-ordinating	CAMHS (co-

scoring member	ordinating body), Teaching Hospital, Regional CHD network	ordinating body, two self-help groups, PCT.	authority care improvement partnership	body, teaching hospital, PCT	ordinating body), Health visiting service, children's centre, three local government departments.
2nd highest scoring member	General practices of 2 PCT leads, non-teaching hospital.	N/A (all others zero).	Teaching Hospital, PCT, local authority, mental health trust	Teaching hospital Commentary: On "A Taxonomy of Healthcare Networks and Systems: Bringing Order Out of Chaos"	Speech therapy service
3rd highest scoring member	N/A (all others zero)	N/A (all others zero)	Teaching hospital	PCT	Jointly: children's centre, educational psychology service, adult mental health services, parenting support
Network size (organisations)	7	3 (but 13 individuals)	23	17	33

In four of the five networks measured, the co-ordinating body did as predicted (H7a) have the highest normalised brokerage scores but across networks the association between these scores and co-ordinating status was not statistically significant. The co-ordinating body never had a uniquely high brokerage score. Some but not all of the other member organisations equalled it. Member organisations in the study networks often had direct links to each other (network densities were high), reducing both the scope and practical necessity for brokers within the networks. Hence the co-ordinating bodies were towards the top of a range of brokerage scores that were generally low. The Small CHD Network members all had brokerage scores of zero because their network was so small that they could create any desired links directly. Brokerage roles, including that of the network co-ordinating body, were practically superfluous. Although its co-ordinating

body was a third-sector organisation not a PCT, the same pattern appeared in the small local Self Care Network.

For comparison, the hypothesis that PCTs (as the bodies responsible for co-ordinating local 'health economies') have the highest brokerage scores (H7a) was also tested by testing whether a dummy variable ('PCT' vs. 'not-PCT') was associated with both the raw and the normalised brokerage measures for each node. For this test we combined node-level data across networks. The test showed no significant correlation between PCT status and normalised brokerage score. So the high brokerage scores of the co-ordinating body cannot be attributed, either, to them being PCTs.

We made a similar analysis for the networks' Bonacich power scores (Table 14). Bonacich power scores measure the extent to which each member organisation is connected to others who are not highly-connected, so that these others depend on the first organisation for links to the rest of the network. The co-ordinating body was in every network in the middle of the range across the member organisations and never had a uniquely high Bonacich power score. Indeed it was (by that criterion) never more than the third most powerful organisation. Neither did the Bonacich power measures show significant correlation with mandated status.

Table 14. Power scores and roles

Power scores	Small CHD Network	Self-Care Network	Children's Hospital Project Network	Urban CHD Network	Child Mental Health Network
Range	1.675-3.351	0.297-4.984	-9.53-9.72	-0.634-6.754	1.456-10.671
Co-ordinating body	1.68	2.88	1.82	2.392	5.08
1st highest scoring member	Non-teaching hospital NHS trust	PCT	Mental health trust	Teaching hospital NHS trust	Adult Mental Health Trust
2nd highest scoring member	Teaching hospital NHS trust	Exercise group	PCT2	PCT3	PCT (public health dept.)
3rd highest scoring member	Ambulance service	Co-ordinating body (3rd sector)	PCT1	Teaching hospital NHS trust	Midwifery service (hospital-based)

Network size (organisations)	7	3 (but 13 individuals)	23	17	33

We had predicted (H4A) that Freeman degree centrality of the co-ordinating organisation would be higher in mandated than non-mandated networks. This hypothesis was supported. Flow betweenness centrality of the co-ordinating organisation was, as predicted, also higher in mandated than non-mandated networks, but the prediction that reach centrality of the co-ordinating organisation would be higher in mandated than non-mandated networks was not supported. The latter finding appears to reflect the relatively high proportions of direct links between member organisations in the networks studied. So although the co-ordinating bodies are somewhat more connected than other member organisations, a 'hub-and-spoke' model of network links has little application to the networks we studied.

In summary, the co-ordinating bodies each had high brokerage scores within their networks, but high only in comparison with brokerage scores that were generally low in all the study networks. In terms of Bonacich's measure of power, the co-ordinating bodies were undistinguished from other network members. The co-ordinating bodies mediated between other network members who were also well-connected to one another. Co-ordinating bodies were not the centre of a star-shaped or 'hub-and-spoke' network structure, except for one layer (money) in one network (Child Mental Health). The sites did demonstrate core and periphery patterns but these were more lateral or 'horizontal' in shape as opposed to the vertical shapes found in a classical hierarchy.

8.3 Co-ordination and hierarchy

Some studies have described certain networks as having a 'hierarchical' character (see chapter 2). We had therefore hypothesised that (H4B) compared with voluntary networks, mandated networks:

1. are more 'hierarchical' in the sense of having a public organisation as a coordinating body (and hence tend to have a pattern of 'vertical' control links from that coordinating body to the other members)
2. are of low density
3. decisions and resources flow mainly from core to periphery
4. have relatively consistent separation (all members relate directly to the core, and to each other mainly via the core)

Certain social network analysts have assumed that hierarchies (in the sense of organisations which hierarchically structured on Weberian or 'Fordist' lines) can be considered as a special type of network. Krackhardt (161) and

Burt (201) have formally defined such hierarchies and developed measures to show the extent to which observed networks approximate in this to 'pure' (Weberian or Fordist) hierarchies. We therefore applied Krackhardt's and Burt's measures to our study networks to ascertain how far the study networks might be described as 'hierarchical'.

Because such high proportions of network members were directly-linked (see above), one condition for the networks to be strongly hierarchical was not met. Nevertheless, one might expect the mandated networks to come closer to the 'hierarchical' model than the non-mandated networks did. We therefore compared (Table 15) the mandated (Children's Hospital Project Network, Small CHD Network, Urban CHD Network) and non-mandated networks firstly in terms of hierarchical reduction, using Krackhardt's GTD measure (161).

Table 15. Hierarchical properties of networks

	Number of nodes	Krackhardt GTD measure				
		Density	Connectedness	Hierarchy	Efficiency	LUB
Small CHD Network	6	0.6624	1	0	0.2000	1
Self-Care Network	8	0.9286	1	0	0.9500	1
Children's Hospital Project Network	23	0.6285	1	0	0.2500	1
Urban CHD Network	14	0.5110	1	0	0.4700	1
Child Mental Health Network	31	0.6624	1	0	0.3609	1

All four dimensions of the GTD measure (connectedness, hierarchy, efficiency, least upper bound (LUB)) must score 1.0 for a pure hierarchy to exist. That is, to be hierarchical the network must display connectedness (all actors are in same structure); 'efficiency' (in the non-standard sense that each node has only one 'in-degree' link to its superior); a Least Upper Bound (unified command or co-ordinator); and 'hierarchy' (in the sense of there being no reciprocated ties). All our study networks displayed full connectedness, i.e. they all had at least one organisation with the links necessary to enable it, if it had the authority or power, to co-ordinate the whole network in an hierarchical manner. But the low 'efficiency' scores mean that in all the networks except Self-Care Network, most members have links to many other members besides the co-ordinating body. No one organisation monopolised the links to other network members. The hierarchy scores of zero are an artefact due to our using symmetrised data matrices, but every matrix had some reciprocal ties before we symmetrised it. Even if that element had been positive, though, none of the study networks would have counted as pure hierarchies on Krackhardt GTD measures.

Neither was there correlation between any of the Krackhardt GTD variables and mandated or voluntary status. This was immediately obvious for scores which did not vary across networks, and the Krackhardt efficiency variable did not significantly correlate with non/mandated status either. Density had been predicted to be lower in mandated networks. Density had been predicted to be lower in mandated networks, but we did not find the predicted significant correlation between the densities of the mandated and the non-mandated networks (table 16).

Table 16. Density and separation: significance of differences between mandated and non-mandated networks

Variable	p
Aggregated density	0.39
Co-ordinator reach centrality	0.12
Co-ordinator degree centrality*	0.00
Co-ordinator flow betweenness centrality*	0.03
Burt hierarchy scores	0.06

** = significant at p=0.05. Unpaired samples, one-tailed t-test.*

The Burt hierarchy scores of the co-ordinating bodies narrowly failed to correlate with mandated status (t-test, p=0.05). However the Burt hierarchy scores themselves were modest (0.32) for Small CHD Network and lower again (0.1 or less) for the others. These low scores mean that network members were, in general, not heavily dependent on (nor, therefore, constrained by) just one other member as a link to the rest of the network. The correlation depended on the presence of one outlying value (Small CHD Network). Repeating the t-test without it removed the correlation.

Because hierarchical structures were absent, neither the networks' co-ordinating body nor the PCTs (where not the co-ordinating body) were the topmost member of such a hierarchy. That finding refutes our hypothesis (H4Ab) that PCTs would be the topmost member of any hierarchical relationships present.

Co-ordinating bodies were more likely to be linked to other member organisations in mandated than non-mandated networks. They had somewhat more power (in the sense defined by the Bonacich measure) in mandated than in non-mandated networks. Yet none of the study networks were hierarchical in any stronger structural sense. In that respect, the mandated and non-mandated networks did not materially differ. So although the study networks were centralised, they were not hierarchical in the sense defined by the formal measures described above.

8.4 Prudent reciprocity

Prudent reciprocity, meaning mutual help-in-kind, is often regarded as a distinctive and typical co-ordination mechanism in networks. Network co-ordinators persuade other network members to contribute time, work and other resources to the network on the basis that the other network members will do likewise, so that each network member will eventually receive benefits from the others in turn. Prudent reciprocity has the advantage, as an exchange mechanism, of being applicable to both the core process and the co-ordination activities of the networks. This co-ordination mechanism presupposes that network members trust one another.

We hypothesised (H4C) that voluntary networks will have more relational, trust-based internal co-ordination and roles than mandated networks. One way of operationalising this hypothesis for network analysis purposes is to contrast relational, trust based co-ordination with hierarchy. Thus the voluntary networks would have less hierarchical network structure, in the SNA-specific sense described above, than would the mandated networks. Whilst, as reported above, one of the Krackhardt GTD indicators (efficiency) was lower in the voluntary networks, indicating greater redundancy of links, none of the study networks was hierarchical, so it cannot be said that the voluntary networks were 'less hierarchical' than the mandated ones. Also, network density in other of the voluntary networks (the user-experience network) was higher than in the mandated networks, but the density of the other voluntary network (Child Mental Health) was not.

Another way to test H4C is to contrast help in kind, as one form relational, trust-based co-ordination link, with co-ordination through financial links. Then, H4C would be supported if the help-in-kind layer were denser in the non-mandated than in the mandated networks. A similar test is whether the difference in density between money-layer and the help-in-kind layer (in favour of the help-in-kind layer) was greater in non-mandated in mandated networks. As reported in greater detail below (chapter 9) the help-in-kind layer in the study networks was significantly denser in all the networks save one, whether mandated or not, and in the remaining network (which was mandated) the two layers did not significantly differ in density. However the size of the differences in density between the two layers did not reflect whether a network was mandated or not, as Table 17 shows.

We therefore conclude that the non-mandated networks did tend to have more relational, in the sense of less-financially mediated relationships than the mandated networks. The non-mandated networks also had a non-hierarchical structure, but so did the mandated networks. These findings tend, albeit equivocally, to support H13.

Table 17. Mandated status and relative density of help-in-kind and money layers

	Status	Relative Layer densities	Significant difference?	Difference in layer densities (maximum is ±1.0)
Child Mental Health Network	Non-mandated	HiK > Money	Y	0.09
Self-Care Network	Non-mandated	HiK > Money	Y	0.34
Urban CHD Network	Mandated	Money > HiK	NS	-0.03
Small CHD Network	Mandated	HiK > Money	Y	0.5
Children's Hospital Project Network	Mandated	HiK > Money	Y	0.08

HiK = Help in kind. Significance level = 0.05.

Our qualitative data also include instances of prudent reciprocity. Self-Care Network members attended events in one another's member organisations and provided practical services such as catering at them. They also offered spare places on trips out to one another's non-Self-Care Network members. In Child Mental Health Network a common form of mutual assistance between members was the cross-posting (secondment) of staff and, for a handful of staff members (mainly managers and psychologists) there had been over the years something approaching a 'revolving door' regime with the same individuals being employed now by the city council, now by the NHS.

In addition many informants told us that the benefit of being in the network was specifically that it enabled the members to pool ideas and other resources, and solve problems collaboratively, producing benefits which each network member could not have obtained alone. Thus:

One of the values here, one of the norms here is, well what's the point of not working together? We achieve more if we share.

(Heart Failure Nurse specialist, Small CHD Network)

Urban CHD Network informants also emphasised the importance of sharing the work of caring for CHD patients across the network members, Its espoused values included collectivity and mutual support. From its origins as a collaborative, the network inherited a tendency to espouse the value of information-sharing. In the user-experience Self-Care Network too,

members expressed one of their main aims as being to encourage the individual participants to feel empowered through doing more for others and over time to develop trust between the individuals and organisations involved.

8.5 Resource allocation

The six NHS networks had by NHS standards relatively few resources of their own, and none of a kind or quantity that could constitute material incentives, beyond the offer of practical help, to the clinicians or organisations that did. Neither did the Children's Hospital Project Network directly control the building programmes on which the service re-profiling centred. Except for Self-Care Network and Child Mental Health Network, the study networks directly controlled few or none of the resources which their core processes used.

Rather, the other five (programme) networks influenced the allocation of resources to patient care in two ways. They influenced, indeed helped draft and undertake pre-negotiation discussions about, service contracts and specifications for the relevant services. The network thus influenced the service contract but did not determine the final draft, which the PCT might amend again before negotiating with the providers. It was then up to the providers to implement the contract and to decide exactly how they did so. So the networks' influence on resource allocation by this route was indirect. Nevertheless, because it made such a large contribution to the commissioning cycle, Urban CHD Network was confident that it could indirectly remove resources from NHS providers that didn't accept the network's policies:

Well I suppose if an acute trust that was providing either cardiac or stroke services and we have one at the moment wasn't performing then I suppose the end result would be that they could lose that service.

(Co-ordinator, Urban CHD Network)

A second route, also indirect, was via the provider representatives, often senior clinicians or other practitioners, who participated in network activities. These acted as boundary-spanners transmitting the network's decisions into the hinterlands of their own organisations. This was bound to be an uneven process. A chief executive could credibly promise to accomplish it, although in CHD pilot site the two hospitals with the most persistent overspends and referral problems were represented not by managers but each by one cardiologist. A consultant can control her own referrals and clinical practice, and her juniors'. If medical director she might also influence those of other consultants in her specialty. Beyond that the consultant's influence wanes and the same applies to other departmental representatives.

Unlike third sector providers, no commercial providers participated in the networks. So the networks' influence of how their resources were allocated was only via the commissioning process and technical guidance, if at all.

All the networks could call upon the services of paid staff to assist (in Self-Care Network) or simply to carry out the tasks of co-ordination. The Children's Hospital Project Network project network had 11 (later 13) support staff who *inter alia* supported a 'massive' communications function and HR activity for the network, besides the education and training described elsewhere. For its major public consultation the network hired in management consultancy support, and City Children's Network did the same to take stock of its local policy options as the guidance and policy statements about children's services multiplied. Conversely lack of managerial staff, due to the uncertain terms of employment described above was a crippling barrier to activity in Regional CHD Network. In contrast, the managers supporting Urban CHD Network regarded the posts as offering good individual career development potential for the managers holding them.

Unlike the NHS-hosted networks, Self-Care Network had meagre managerial resources. Those which it did have were contributed *gratis* by one of the member organisations, which already had buildings and some administrative support, the costs effectively being met by the Baptist Church who owned the premises. Self-Care Network was initially co-ordinated by two volunteers but once the largest member organisation became part-funded through its own contract with the city council, one of them (who is trained in leisure and recreation services work) became a full-time co-ordinator. Even then, one member-organisation entirely relied on self-help but this was precarious because if, as happened, an active member became ill, the group struggled to operate. When Self-Care Network sought to be commissioned, however, it members became conscious that they lacked the bureaucratic skills, and even such resources as ready access to a computer, required to produce the contract documentation which prospective commissioners demanded.

An unexpected finding was that the Self-Care Network did not spend all of their £5,000 allocation from NIMHE but only £2, 000 of it. They used the rest to purchase a digital camcorder and laptop which they used to film and watch the physical activities they organised. Nevertheless the Self-Care Network member organisations were keen to obtain practical or extra financial help from outside bodies and had some success in getting it.

8.6 Shared values

Various categories of shared values were found in the study networks. To the extent that networks expressly negotiated goals at their foundation (see

chapter 5), these goals provided one source of values to which network members and co-ordinators could appeal.

Mandated networks had shared values externally supplied, so to speak, by policy-makers (see chapter 5). These shared values were national priorities and targets, managerial norms and formalised managerial techniques. That managers should adopt such norms was hardly surprising but we less expected that senior hospital doctors would do so too. Although originating outside the network, these mandates appealed to what might be described as tacit political values already held by network members themselves; almost no-one questioned the legitimacy of these policy mandates. Rather, the NHS quasi-hierarchy (198) resulted in the NHS member organisations having to comply with a common set of policies, guidance documents, and strategic managerial decisions (e.g. about cross-regional referral patterns). Adherence to these precepts coloured and constrained the agenda and decisions of network meetings.

Certain normative assumptions were apparent in network members' decisions and discourse, although seldom formulated explicitly. In Child Mental Health Network for instance the tacit assumptions among network members included, for some occupations (e.g. midwives), a strong professional identity which pre-dated their role in the network. In the user-controlled network a fundamental underlying assumption was that the network relied entirely on self-help, making it critical to retain existing and recruit new members. Although welcome, practical or financial help from outside bodies was a bonus. At exercise events any level of participation was acceptable, even just turning up and doing little physical exercise itself, notwithstanding the (unavailing) presence of a physical exercise trainer provided by the city's umbrella organisation for the third sector. We take this as evidence of an underlying assumption that the network existed more for the members' use than to impose expert norms of what constitutes healthy exertion. In the CHD networks it was largely taken for granted that clinician, especially medical, participation would enable the network to influence the design and commissioning of cardiac services in ways that served patient interests. In the mandated NHS networks, the allocation of roles was usually on the basis of the individual's profession, rank and job title. In the non-mandated child mental health networks, certain network roles (above all, that of co-ordinator) were also allocated in that way, but other roles were allocated on a voluntary basis. All roles in the self-care network were allocated according to who volunteered and was endorsed in group discussion. These patterns tend to confirm our hypothesis (H4D) that voluntary networks have a negotiated allocation of roles.

Shared values were also produced on occasion by debate and negotiation within the network, as part of its co-ordination process. Decision-making

was generally consensual, but the style of decision-making varied between, and within, networks. For instance, Urban CHD Network was strongly integrated and cohesive, with a strategic perspective, but this occurred through the dominance of a few powerful individuals rather than through any more formal decision making process or other managerial systems. When it came to allocating work its style of decision was to start with informal discussion about who among the network staff would undertake what work for cardiac specific and stroke specific areas, and generic of work concerning governance, finance and patient involvement. The network board would then ratify the proposals, which would finally be formalised as a work plan with key performance indicators. In Small CHD Network the co-ordinator was reported as playing an important role in getting proposals for service changes properly discussed:

Quite often you sit in a meeting, you have a great idea and it doesn't go anywhere, whereas [co-ordinator]'s able to help you, she often knows the man who can, even if it's not her, and I think that is as much as anything is incredibly valuable.

(Heart Failure Specialist Nurse, Small CHD Network)

In the children's services networks where there was substantial non-NHS membership and with statutory organisation members under the aegis of different central government departments, it was still less feasible for a single body to control network decision-making. The Children's Hospital Project Network board, exceptionally, had powers of veto over local health organisations' proposals for changes in children's services.

In Self-Care Network, the PCT worker described differential levels of leadership between the member organisations. This affected the groups' respective ability to initiate activities and we found no evidence that the network was able to change this. The main member organisation and one of the PCT's health development workers were the *de facto* 'leaders' of the network. The largest member organisation was strongly driven by Christian values, but not the other two organisations nor the network membership as a whole.

Evidence based practice, discussed below, was the remaining and perhaps most important source of shared values.

Lack of shared values was also apparent, in two ways. The more common was the simple lack of shared assumptions about the remit, or even the existences of a network. Within each of the main occupational groups in Child Mental Health Network we discovered disagreements about the definition of child mental health problems, indeed about whether children under five can meaningfully be said to have mental health problems at all. Many informants, who in fact collaborated in caring for young children, did not perceive themselves as network members. They found the network opaque:

I'm still working hard to understand how a network can exist in a way that isn't just a group of services cooperating. What can a network do that belongs to it, and even though it's not an organisation - how can it be seen, how can it be commissioned, how can it be performance managed?

(Social worker)

Few informants appeared to know or understand the network's care pathway structure as a whole. As explained below, many members in the larger networks did not regard themselves as network members; among them, a network identity was absent. The practical expression of this was non-participation (a passive form of 'exit') from network meetings they were repeatedly invited to. In Child Mental Health network, paediatricians, adult mental health services and social services representatives rarely attended meetings.

Conflict was the other evidence that values were far from shared. We were able to analyse the expression of conflict and power via decision making, leadership and the control of resources and to a degree the expression of culture within the networks. In the CHD pilot site network a leading cardiologist stated that the clinicians saw one role of the network as being to prevent managers making misguided commissioning decisions. The most overt conflict occurred in Regional CHD Network, over the role of GP members and the network's remit following the merger of PCT-based networks into a regional network. It is described above (chapter 7). This was the clearest example of conflict over the transition from care to programme network, a transition making some primary care professionals and managers more marginal to the networks. Such conflicts also represented a shift in the network's shared values from its founding goals to those of a mandated programme network.

Considering the importance of occupational identity in health systems it might be expected that networks with more heterogeneous membership would be more likely to experience internal disputes, leading to delayed decision making and reduced network effectiveness. In our study the CHD networks had less heterogeneous memberships (mostly or all NHS organisations) than the children's services programme and project networks. In general, we did not observe that the children's services networks were more prone to controversy and dispute than the CHD networks. In fact meetings in these networks were marked, although at times by debate, always in our observation by an atmosphere of amity and cooperation. Two of the children's services networks were relatively old, and in the third many of the individuals leading it had been collaborating for some years, allowing strong relationships to develop. Especially in Child Mental Health Network, value-conflicts about the the nature of the health problems the networks were addressing and the best ways of addressing

them were accommodated by the peaceful co-existence of the differing attitudes (202).

8.7 Knowledge management: evidence based practice

Knowledge management in the form of production and dissemination of technical guidance, usually based on concepts of evidence based medicine or practice, was ubiquitous in the NHS networks. A large proportion of network artefacts concerned evidence-based medicine (see chapter 12). The innovation-related activities about which we collected survey data included several activities (e.g. evidence reviews, plan-do-study-act cycles) connected with evidence-basing. They were reported in all but four of the 55 organisations about which we had data.

Evidence-basing had an important role in network co-ordination. At simplest it was used to disseminate and promulgate the network's decisions and mandates to others; and as evidence of the network's productivity and value. Insofar as its scientific bases are valid, evidence-based technical guidance rests upon what, following Therborn (109), we have called an 'impersonal mandate' . It was thus open to network co-ordinators to use the appeal to scientific validity to depoliticise and depersonalise the decisions and norms which the network promulgated, and so pre-empt or resolve conflicts. They could say: it is not the government or we managers or consultants who require this, but the evidence. Additionally technical guidance was used as a way of creating trust between co-ordinators and clinicians by recognising the value of the clinicians' inputs into the network in a way that conserved rather than threatened, the clinicians' professional jurisdictions. Thus in Children's Hospital Project Network, the network legitimated its activities and decisions partly in terms of being a means to ensure the implementation what the clinicians themselves had pronounced to be good practice:

they will tell us what that is so we will say to them "you tell us what the evidence is and best practice and we'll work the logistics through and look at the implications for the workforce etc, etc."

(Deputy co-ordinator, Children's Hospital Project Network)

Network Urban CHD Network co-ordinators could draw on an external source of technical authority by exploiting their links to the lead for the national heart improvement programme. Its public health doctor also provided epidemiological data that transcended the views of the individual PCTs about CHD and the relevant services.

Self-Care Network was the exception to these patterns. Except for one evaluation report it undertook no evidence-basing of its activities. Otherwise the nearest it came to evidence-based activity was that it took on trust that

there is evidence that self-care activities it provided would actually improve the participants' physical health.

The conspicuous role which knowledge management played in the NHS networks was due to the fact that knowledge management had several advantages as a co-ordination mechanism. It provided an impersonal mandate for network activity and the intended consequent changes in service provision. This mandate appealed to professionals' (and not only clinicians') intrinsic motivation to provide better care. We found that it applied across professions and its legitimacy was practically unchallenged. It was a source of artefacts which could demonstrate network activity and contribution to the local health economy. For care and self-care networks, the resulting guidance was of immediate practical application and increased the effectiveness of network activity. For programme and project networks, evidence-basing provided the content for many of the artefacts which the networks were mandated to produce i.e. policy advice, material for contracts, project plans and re-designs of services and infrastructures. Even when network members had no shared view of the rationale or goals of the network as a whole, evidence-basing created normative agreement at least about how (if not about why) the network's core process should be undertaken. Lastly, evidence-basing was a co-ordination mechanism that did not require other governance structures. It could be (and was) used in the absence of contracts, command or coercion as co-ordination mechanisms.

The important differences in how the highly medicalised CHD networks, the moderately medicalised children's networks and the non-medicalised self-care network were co-ordinated lay not in their network structures, but in the extent to which knowledge management was available to them as a co-ordination mechanism. Partly this reflected the differences in the composition of their membership, because knowledge management in itself presupposes a certain level of technical expertise on the part of those whose knowledge is managed. Much more, however, it reflected the availability of relevant evidence-based technical guidance and of the means of managing the development and application of such knowledge.

8.8 Governmentality and identity

Management by means of governmentality requires transparency of the network members' activity to the co-ordinators or the rest of the network; and a strong network macro-culture which promotes the requisite value-beliefs and self-image. The self-image ('identity') element of the cultural requirement was often weak in the NHS networks although as explained below other value-beliefs were stronger, especially belief in evidence-based practice. As explained in our findings about the different layers of network

links, the information systems which would make network members' activity transparent to the rest of the network were only partially present.

Network identity was not well-developed. As noted above (Table 6) many people who we were told were network members did not regard themselves as such. This pattern was clearest in Child Mental Health Network, one of the longest-established. In Child Mental Health Network many informants, all of whom in fact collaborated in caring for young children, did not perceive themselves as network members. They found Child Mental Health Network complex and opaque. Few informants appeared to know or understand the underlying care pathway structure as a whole. Whilst they understood quite clearly their own professional roles and *de facto* contributions to the wider activity of co-ordinating mental health care for young children, the fundamental property of having an explicitly-defined membership was largely absent from Child Mental Health Network.

In Small CHD Network the fact that one network was nested within another also confused network memberships and identities:

they're aware that it's a [city] CHD network, because we use the word network and we think we're working in the [sub-region] cardiac network and so the word "network" is sometimes a bit confusing, there are that many agencies, people are not always sure about which one they should go to between the trust and the network, it can get confusing really.

(Ambulance Trust representative, Small CHD Network)

We assume that a person who does not see themselves as a network member will hardly see themselves as having much claim upon the network's decision-making processes or its resources, nor be likely to feel much obligation to implement its decisions.

Network information systems (described more fully in chapter 9) were not always sufficient to monitor the effectiveness of the network as a whole, let alone the exact contribution of each member organisation. Furthermore, much of that contribution was made in the hinterland of the member organisations beyond the reach of the networks' information systems. If it was known even to the member organisation, this information was not necessarily made available to the networks. Less formal information was however available; network members could and did notice whether, for example, other network members completed tasks they had undertaken to perform.

There was thus only a limited role for governmentality as a co-ordinating mechanism in the study networks. Evidence-based practice, rather than values particular to the networks, was the main mechanism of governmentality.

8.9 Summary

In summary, all the networks had well-developed co-ordinating structures on a 'steering committee plus working groups' model with, in the NHS networks, a managerial support infrastructure. The co-ordinating body was quite central to the networks, but the networks were not in any formal structural sense 'hierarchical'. Prudent reciprocity i.e. the exchange of help in kind was an important means of network co-ordination. In all except the experience network, so was evidence-basing. Decisions were mostly reached by negotiation of a consensus, although always within the constraints of policy mandates in the mandated networks. Shared values played a part in network co-ordination but the sense of network identity was patchy and a small number of disputes occurred. Resource allocation played little role as a means of co-ordination and governmentality not much more.

9 Layering

Here we answer the research question:

> RQ5: How do the different layers of network, dealing with different media or contents, co-exist and influence each other?

Our analytic framework distinguished two main types of 'layer' of links in clinical and professional networks. These layers consist of the links which are:

1. Productive links, producing the activities and artefacts, and through them the outcomes, which the network's objectives state.
2. Co-ordinating links, stimulating network members to participate in the core process by (for example) financial incentives or, especially in networks, mutual help-in-kind.

In the above sequence we present our findings network by network about how the different layers co-exist and influence each other; and then describe patterns across the networks. In the tables which describe each network we wanted to anonymise sites in a way that still enabled us to represent the type of organisations or organisational units that were network members. We therefore gave each member organisation a pseudonym composed as follows:

> 1. The first group of characters shows the type of organisation (e.g. 'PCT') and, if there were several of that kind, which particular one ('PCT2', 'PCT3' etc.).
>
> 2. For the Child Mental Health network only, a second group of characters (where used) shows a department within that organisation.

When several organisations are mentioned in the same cell of a table, it means they all equally shared the relevant characteristic.

9.1 Core layer and non-core layers

We predicted that network layers through which the core process of a network are delivered (direct client care in care networks; client care organisation in programme networks; general administration, in project networks; help-in-kind in user-experience networks) will be denser than the other layers (H5A).

Which of the three layers direct patient care, patient care organisation and administration contains a particular network's core process depends on what

the goals and therefore function of that network are. To explore the relationship between the layers in each network we ascertained for each layer in each network its density, which were its isolated and its pendant nodes (member organisations), and which nodes had greatest (Freeman) degree-centrality and flow centrality. (A pendant node is one which has only one link to the rest of the network. Isolates are member organisations without any link to the rest of the network.)

9.1.1 Small CHD Network

Table 18 shows these findings for the small CHD network.

Table 18. Layer characteristics, small CHD network

SMALL CHD NETWORK	Direct client care	Client care organisation	Administration	Help in kind	Money	Overall
Density	0.57	0.83	0.57	0.73	0.23	0.66
Isolates	None				DGH	None
Pendants					PCT	
Highest degree centrality	TH					
Highest flow betweenness						

DGH = District General Hospital. TH = Teaching Hospital.

As a care network, direct patient care was the core process of Small CHD Network. The local teaching hospital was on both measures and for all network layers the most central body, even though the local PCT was officially the network co-ordinating body. This was also a very dense network partly due, we infer, to its small size. This network therefore had the classic structure of a local referral network, centred on the local district hospitals.

9.1.2 Self Care Network

Table 19 shows the main characteristics of the five layers examined in the network providing physical self-care for adults with long-term mental health problems. As a self-help network, direct client care was its core process. Because it was a user-experience self-help network whose active members were mostly patients or ex-patients, care has to be taken in interpreting the descriptions of layers. 'Help in kind', 'money' and 'direct client care' have the same meaning as in the other networks. 'Clients' means 'network members themselves'. We asked our informants to interpret 'client care

organisation' as any exchange of information about the selection and running of self-care activities for the network members, and 'administration' to refer to any more general activities that supported the network (e.g. fund-raising, recruitment). We know from our qualitative data that the maps and matrices omit groups like Remploy, a local social enterprise and the PCT's smoking cessation service. They attended early network meetings to provide advice on returning to employment or training and giving up smoking (which for this network were direct patient care activities), but only attended once or twice.

Table 19. Layer characteristics, self-care network

SELF-CARE NETWORK	Direct client care	Client care organisation	Administration	Help in kind	Money	Overall
Density	0.82	0.77	0.25	0.48	0.14	0.93
Isolates	None		VO1	None	MH; VO4	None
Pendants			MH; PCT1	MH1	PCT; VO1; VO3; VO5	
Highest degree centrality	VO1; VO2: VO3; VO5: PCT	VO1; VO2; VO3; VO5: PCT	PCT; VO2; VO5	PCT; VO5	PCT	
Highest flow betweenness	VO1; VO2; VO3; VO5; PCT	VO1	PCT	VO1		

VO = Voluntary Organisation. MH = Community Mental Health Unit.

MH appears as a member of the network purely because one of its workers accompanied some of the patients to the mental health groups.

Self-Care Network was very decentralised partly due, we infer, to its small size. For the administration layer, three members of the eight had equal highest degree centrality. For both the direct client care and the client care organisation layers, five of the eight members had equal highest, indeed the highest possible, degree centrality. The same applied to flow betweenness in the direct client care layer (but not in the client care organisation layer). In all layers except money the network organising body was among the most central. The PCT's public health department was also central, but most clearly in the money layer, because (we infer) of its role in helping the network obtain evaluation project status and a grant from NIHME. Later, a PCT public health worker helped the network co-ordinating body to get mainstream funding by helping them write the bid and persuading the relevant commissioner (the city council) to go and see their work. After these two organisations, one of the two founder voluntary organisations was

third most central, especially on the flow-betweenness measure. It and another voluntary organisation are at the centre of the direct client care map and among the most connected because as the study period progressed they took over much of the responsibility for providing the network's client care activity – in this case physical exercise. Nevertheless, the map of direct client care layer places the PCT public health workers at the centre because they carried out physical health checks of network members, offered health advice when issues were found, and attended and helped organise these events.

Self-Care Network's core process layer (direct client care) was the most dense. Although not significantly more dense than the client care organisation layer, it was significantly denser (by at least a half) than the other layers.

In summary, this network had the classic structure for a referral network: small, decentralised and focusing on mutual practical help in everyday service delivery.

9.1.3 Children's Hospital Project Network

The five layers in the children's services project network had the characteristics reported in Table 20.

Table 20. Layer characteristics, Children's Hospital Project Network

CHILDREN'S HOSPITAL PROJECT NETWORK	Direct client care	Client care organisation	Administration	Help in kind	Money	Overall
Density	0.60	0.53	0.26	0.32	0.24	0.63
Isolates	None				LA4	None
Pendants	None		LA4	None	LA3	None
Highest degree centrality	DGH4; TH1; PCT1; PCT2;	LA3; PCT1; DGH4	DGH4		PCT1	DGH3
Highest flow betweenness	PCT1; PCT2; DGH4	PCT1; DGH4	DGH4	TH1 (closely followed by DGH3)	PCT1	

DGH = District General Hospital. TH = Teaching Hospital. LA = Local Authority.

The most central bodies in terms of reported linkages were an acute hospital NHS Trust and one particular PCT, the former on the edge of the

city and the latter about 30km from it. Local authority members played a rather marginal roles (as pendants or isolates, in some layers) except for patient referrals, for which they have high centrality, due to their role as providers and commissioners of domiciliary social care. By no measure was the nominal co-ordinating body the most central in terms of linkages. It was least central of all in regard to patient referrals but given the function of this network as a project network that was only to be expected. In terms of direct client care and help in kind, three of the NHS acute trusts were most central. For client care organisation, a non-teaching acute trust some 30km from the city was most central. In general the network was quite dense. Only the administration and the money layers had any isolated or pendant members. Only two member organisations, both local authorities, fell into these categories.

The core function of this project network would be expected to be administration, but this was the least dense layer of the network apart from money. There was no significant difference in density between the administration and money layers; nor between the administration and help-in-kind layers; nor between the direct client care and the client care organisation layers. The direct client care and client care organisation layers were approximately twice as dense as the administrative layer and this difference was highly statistically significant (p=0.0002).

So this network was more paradoxical and its structure raises some questions. The layer most relevant to its mandate (administration) was the least dense but one. The pattern of layer densities was like that pattern which our chosen taxonomy (169) would impute to a referral or a programme, not a project, network. This requires explanation.

9.1.4 Urban CHD Network

Turning to the Urban CHD Network, Table 21 shows each layer's characteristics.

A striking characteristic of this network is that just two nodes were central (on both measures) across all the different network layers. On both measures the network co-ordinating body (hosted by one of the member-PCTs) had greatest centrality for all four layers except direct patient patient care, where the largest, best-known teaching hospital had greatest centrality. But although direct client care was (jointly with direct client care) the least dense network layer, this teaching hospital was sufficiently central in the other layers to make it the member organisation with highest centrality on aggregate. No member organisations were isolated (unconnected to any other member organisation) and only one was a pendant. This was a PCT which had only one link for the purpose of direct client care. As this was a programme network, our analytic framework

would predict the client care organisation layer to be the one accommodating this network's core productive activity. There were no significant differences in density between that layer and the other four layers however.

Table 21. Layer characteristics, Urban CHD Network

URBAN CHD NETWORK	Direct client care	Client care organisation	Administration	Help in kind	Money	Overall
Density	0.19	0.32	0.38	0.36	0.40	0.51
Isolates	None					
Pendants	None	PCT6	None			
Highest degree centrality	TH1	Co-ordinating body (PCT7)				TH1
Highest flow betweenness						

Together these findings describe a relatively cohesive network with deep (multidimensional) links between its members. Like the project network, but to a lesser extent, this network also had a paradoxical layering. No single layer was clearly the most dense, although our chosen taxonomy of networks predicts that in a programme network, the client care organisation layer of links will be the most dense. Of the study networks, the co-ordinating body in this one also came closest to Provan and Kenis' (76) concept of a unique 'network administrative organization'.

9.1.5 Child Mental Health Network

As before, Table 22 shows the layer characteristics of the network. All these data pre-date PCT mandate, control and shift to commissioning focus.

Across all layers in the Child Mental Health Network CAMHS, the network co-ordinating organisation, was consistently the central node in terms of betweenness centrality, and jointly so for the direct client care and client care organisation layers in terms of degree centrality. Local authority children's services had (joint) highest degree centrality for all layers except one (help in kind) and in the aggregate. To put this finding in perspective of the qualitative data, it should be noted that nevertheless CAMHS was never a very centralising body. It and the whole network were vague about the network's purpose until quite late in the study period. In practice one of the Children's Centres provided most of the administrative support for meetings etc. until the very end of the study period, when the PCT took over that role.

Table 22. Layer characteristics, Child Mental Health Network

CHILD MENTAL HEALTH NETWORK	Direct client care	Client care organisation	Administration	Help in kind	Money	Overall
Density	0.26	0.27	0.19	0.14	0.05	0.66
Isolates	None			DGH-paediatrics	CC1; DGH-Clinical Psychology; LA-Early Years Inclusion; LA-Parenting Support	None
Pendants				DGH-Clinical Psychology; AMH	CC1; LA-educational psychology; DGH-speech therapy; DGH-paediatrics; AMH; HV	
Highest degree centrality	CAMHS; LA - children's services	CAMHS; LA - children's services; HV	LA - children's services; HV	CC1; LA-Early Years Inclusion	LA - children's services	
Highest flow betweenness	CAMHS					

AMH = Adult Mental Health Services. CAMHS = Children's and Adult Mental Health Services. HV = Health Visiting Service (PCT-managed). CC = children's Centre. DGH = District General Hospital. LA = Local Authority.

This network's core process was direct patient care. This layer was not significantly denser than the client care organisation layer. Neither was it significantly denser than the administration layer but it was significantly denser than the help in kind and money layers. It was noticeable how visually similar the direct client care and client care organisation maps were. In practice the greatest referrals were from other nodes to and from the Children's Centres. As noted certain nodes (member organisations) were

central for all the layers except help-in-kind. These were a newly-built children's centre, the joint commissioning body, city council's child protection services and CAMHS.

Our qualitative data show that certain member organisations which appear in the network maps as linked to the rest of the network actually played rather marginal roles in the network. Clinical psychology like adult mental health services were mainly oriented at adults, getting involved in child mental health only if the carer/ parents' problems (e.g. addiction) had generated mental health problems for their children, or were expected to. Midwifery was bound to be peripheral because midwives' involvement ends so early in a child's development. Conversely parenting support was something of a last resort, afforded to parents only after the parent(s) and child had gone through other services. The early years inclusion service was only involved if a child already had mental health or behavioural problems, and was an educational not a clinical service. Paediatricians rarely attended meetings, nor did adult mental health representatives, nor social services representatives. The links to these network members therefore operated outside formal meetings.

In terms of which layers were most dense and which organisations were most central, this network conformed to type as a referral network. Although the network was long-established (only the project network was older), its density was lower than that of more recent networks. This comparison calls into question the assumption that the passage of time, alone, allows network links to accumulate and become denser.

9.2 Money versus help-in-kind

The money-mediated layers of links distributed only those monies which member organisations allocated to each other through the networks. Not all the funding links between member organisations were mediated through, or even visible to, the (rest of) the network. Indeed by far the most substantial financial links (service contracts, budgets. PBC) were usually outside of the network, running in parallel to network links and not through them. The NHS networks had at most an indirect, advisory influence on those allocations, and the user-experience network had none.

With that interpretive proviso we used the findings above to compare the density and other characteristics of the money-layer and the help-in-kind layer, again presenting our findings by network and then drawing out the general pattern across networks. We assume that the denser a layer, the greater the part it played in stimulating co-ordination among network members.

Two different patterns were found in the relationship between the money and the help-in-kind layers.

In three networks, the help-in-kind layer was considerably and significantly more dense than the money layer. The help-in-kind layer in Child Mental Health Network was almost three times as dense as the money layer. The former had fewer (and different) isolate and pendant nodes. These findings suggest that money flows (hence, financial incentives) played little part in the co-ordination of this network. The money layer had the same most-central organisation (viz. the PCT public health department) as the other layers but was not otherwise structurally similar to them. Only the money layer of the network in Small CHD Network had any isolate or pendant nodes at all. Its density was also less than one-third that of the help-in-kind layer. In Self-Care Network, the money layer had less than one fifth the density of the direct client care layer. In all three layers the difference was highly statistically significant.

In the two other networks, the money and help-in-kind layers were not significantly different in density. At Children's Hospital Project Network the help-in-kind layer was less dense than the money layer, but the difference was only just at the declared threshold of significance (on a one-tailed but not a two-tailed t-test). In any event, the member organisation with greatest centrality in both these network layers was one of the member-PCTs, not the network co-ordinating body. Both the money and the help-in-kind layers in Regional CHD Network had similar density. (Although the money layer was slightly denser the difference was not statistically significant.) In both of these layers the same organisation – the network co-ordinating body – had the greatest centrality. This finding is consistent with inferring that money and help-in-kind played approximately equal roles as media of network co-ordination.

We return to these finding in discussing the role of incentives (RQ7).

9.3 Information

9.3.1 Feedback from patients and careers

Across all the NHS networks, consumer feedback was obtained through meetings and consultations rather than consumer research (in contrast to, say, recent trends in general medical practice). The NHS networks' collected user feedback through user involvement in network committees or sub-groups, and *ad hoc* surveys. The latter were not frequent; in none of the networks did they occur more than once in the study period, and not at all in two of the three children's services networks. In contrast the remaining children's network (Children's Hospital Project Network) had taken by far

the most extensive and sophisticated user-experience survey of the NHS networks studied.

After some of its physical activity events (more often the sports and games events than food events or excursions) Self-Care Network ran feedback questionnaires to elicit users' opinions of the events. Until late in the study period this was its only systematic information feedback system besides turning up and speaking at network meetings, which any member could do. User feedback was however of great importance to Self-Care Network, for recruiting and retaining new members was essential to its sustainability.

9.3.2 Information from the network to patients and carers

Information for the public to scrutinise was disseminated with varying degrees of thoroughness. CHD pilot site had by far the most comprehensive and detailed website (we downloaded over 300 items), on which a mixture of policy documents, guidance, network administrative documents and data about activity in the CHD services it covered.

9.3.3 Clinical activity

The CHD networks tended to rely on national standards and targets for both the criteria (e.g. for clinical quality and service access times) and data by which to judge the network's and its member organisations' activities. Urban CHD Network used as its performance data comparative survival rates provider by provider. For example, they were in 2008 considering removing services from one provider (member organisation) with a mortality rate for CHD patients four times the national average. To check adherence to their care pathways and targets, they instituted clinical audits, initially of waiting times for cardiac disease treatments, and later for revascularisation, heart attack, acute coronary syndrome, cardiac rehabilitation, heart failure and arrhythmia. Network Urban CHD Network attempted to monitor providers' performance 6-monthly, but for some activities monitoring only 12-month or *ad hoc*, obtaining the information from the relevant member-PCT leads. However the network also relied upon data from the DH, its regional health observatory and local academics. Similarly, Regional CHD Network obtained and circulated both national data on access to and the impacts of CHD services, but also circulated quite detailed local data about the performance of each local trust (for example, SMRs per trust for specific cardiac conditions). This pattern of re-use of national standards and data collection systems for monitoring network activity was also found in the large project network for children's services (Children's Hospital Project Network).

Informants in these networks tended to be quite conscious of the necessity for, and of the networks' plans to strengthen, the sharing of clinical data. Their reasons for doing so were so that:

the [Small CHD Network] network, and the [overarching] cardiac network are able to share that information around so everybody can see what the performance is in other hospitals because its out there and you can't hide away from it any more and its there and you, if you've got a problem in your own hospital, like in [hospital], they were unable to meet the call to needle figures, you're able to see you're not and everybody else is, so its not, you're not putting your head in the sand, you've got to identify, you've got to recognise that there's a problem here that other people have managed to solve.

(Ambulance representative, Small CHD Network)

CHD pilot site network attached high importance to collecting monitoring information, spending most of its budget on a database supporting clinical audit, with the intention in doing so of developing an infrastructure for collecting other kinds of data across the network. The principle at issue in this activity was:

transparency is one of the biggest things that we ask of the network and that's we have with them, and a commitment to share goals really, those two things, a commitment to share goals and their commitment to transparency. And its something we have with [network place-name] and it's improving elsewhere too.

(Deputy co-ordinator, Small CHD Network)

Thus in Small CHD Network this informant advocated creating a web-based referral monitoring system because at present,

we've even got a situation where patients who have been referred for angioplasty have their angiograms sent from the secondary hospital to the tertiary hospital in taxis, you just think, well this is the 21st century and we're sending taxis with CDs in, we should be able to email this stuff electronically.

(Ambulance representative, Small CHD Network)

As for the automated information system which Urban CHD Network had promised,

Yeah, I've been frequently told it's going to be very useful but I've never actually got onto it.

(PCT public health doctor, Urban CHD Network)

Network Urban CHD Network introduced clinical audits to check adherence to its policies and care pathways.

In contrast, two of the children's networks (Child Mental Health Network and City Children's Network) still lacked well-organised systems for monitoring their members' clinical activity. In Child Mental Health Network especially, there was a technical reason for this; the evidence base for service models for mental health care for young children is very small and generally of poor quality (Stenhouse et al, submitted).

Self-Care Network had no routine information-collection about the health outcomes of their activities, but considering that these outcomes are mostly likely to be very long-term (decades, for say life-time incidence of heart disease) this was not surprising. The network enabled its members to get weighed and estimate their BMI, but the network itself did not record those data.

9.3.4 Management information

Child Mental Health Network had little in the way of systematic management information collection (e.g. on budgets, compliance with mandates, workloads), relying more on *ad hoc* measures. It sometimes circulated and discussed information provided from member organisations. It also commissioned external researchers to carry out evaluations, one of which (of the new children's centre) included data about referral and activity patterns there. That however was a once-only piece of information-gathering undertaken to support funding bids.

Again Children's Hospital Project Network was a contrast. Long-term and large-scale data on needs and demands for children services was the information most needed for the Children's Hospital Project Network's project. Its sub-network working groups collected some kinds of monitoring information for the network:

if we want to know "how many" of something, we're usually talking about people at this point because you wouldn't expect them to count activity but if we want to know how many advanced practitioners we've got or how many consultants and what's your on-call rota look like, they [sub-networks] collect that for us.

(Co-ordinator, Children's Hospital Project Network)

So far as service planning was concerned, a problem for the Children's Hospital Project Network was that of trying to predict future demographic changes in the city and its environs, and the implications for children's services:

you have an influx, let's say from Eastern Europe, who feel secure, bring their families, have other families, they have babies – the national statistics haven't caught up with that. We have to take the best guess of what that means to us? Will these people stay? Will they stay in [city]? Will they stay in this bit of [city]? Will they have their babies and go back when we hit a recession? What effect does that have on the children's population? … So we're constantly having to adjust our figures, based as far as we can on local knowledge.

(Co-ordinator, Children's Hospital Project Network)

For this sort of information the network had to rely on its member organisations and publicly available data. Concomitantly, the annual budgetary costs for the re-profiled services were constantly having to be re-estimated and re-apportioned among the member organisations.

Less formal information was however available for managing network activity in Self-Care Network; network members could and did notice whether, what other network members practically contributed to the network. In this network the few information systems were informal and straightforward. Its activities were of a scale and character that all members could readily understand. The network had practically no information links beyond what immediately emerged from the exercise and other events themselves. Monitoring information about attendance at events and costs were collected, besides the recording of decisions, actions, membership and contact details; but little more information was collected or necessary. Mostly this information was held in paper records, but at times the members had access to word-processing and the internet. More recently, city council funding of the largest member organisation necessitated their collecting performance data about their contribution to Self-Care Network.

9.3.5 Network information systems

Among links transmitting information, the following patterns thus appeared:

1. Though still far from comprehensive, the CHD networks' information systems for monitoring clinical activity by member organisations and across the network as a whole were relatively well-developed compared with those for information about patient and carers' subjective experiences and feedback. Where the latter were monitored at all, it was through *ad hoc* surveys and patient representatives on network managing bodies or sub-groups. In the user-led self-care network, the reverse pattern was found; well-developed user feedback with almost no clinical (or equivalent) information. Of the children's networks, only the project network had well-developed methods of service planning and modelling; and collected analogous kinds of clinically-related information to that found in the CHD networks.
2. The NHS networks were generally aware of the information requirements arising from their work, and of gaps in the availability of the information, and therefore information links, available. The networks continued to develop their capacity for monitoring through information systems but from a low starting point. Mostly the networks relied on their member organisations, especially the SHA and PCT, collection of monitoring data but as other studies testify, those systems themselves have trouble collecting basic monitoring data (18). In these circumstances the networks constructed information links in two ways. Either the networks, in an *ad hoc* way, pooled or re-used existing NHS data-sets or they set up new data collection from their own budgets.

3. The transparency of network activity which management of the network by means of governmentality would require was generally regarded as desirable, but still constrained in practice by the absence of the necessary information systems in the NHS networks. In the experience network, informal mutual scrutiny ('concertive co-ordination') was a substitute.

9.4 Summary

Taking the above patterns of layering across the five networks for which we had SNA data, the following patterns appear.

The layer containing the network's core process was the densest layer in three of the networks but not, apparently, in the project network. There, direct client care was the densest layer and the client care organisation layer was not significantly different. In the larger of the two CHD programme networks (Urban CHD Network) the layer (client care organisation) containing the core process did not significantly differ in density from any of the other layers except direct patient care (which was less dense). In three networks, the hypothesis that the layer containing the care process is densest is supported, as it would be in a fourth network if one allowed the hypothesis to stand when no other layer was denser than the one containing the core process (and at least one other layer is less dense). Where the layer containing the core process is not the most dense possible inferences are to:

1. count this as evidence against the hypothesis (though countervailed by evidence from a greater number of networks)
2. pose a new research question as to what the conditions are, under which the layer containing the core process is not the most dense layer.
3. conclude that this fifth network was not in practice a project network as its official mandate supposed, but that in fact it functioned as a either care or a programme network (since direct client care and client care organisation were the joint densest layers). This conclusion saves the original hypothesis but poses the further question of how a putative project network came to function as a care or as a programme network.

Our qualitative data tend towards supporting (3) because in terms of membership, activity and artefacts the project network also undertook a great deal of activity more typical of the other care and programme networks (e.g. implementation of service quality standards, re-organisation of referral routes) which are neither specific to, nor typical of, the management of large capital projects. If we re-interpret the function and therefore core process of

Children's Hospital Project Network in this way, it fits into the pattern found elsewhere. For the client care organisation layer in Children's Hospital Project Network was nearly two-and-a-half times as dense as the money layer and this difference was highly statistically significant (p=0.0002).

Unexpectedly, considering that tertiary hospitals stand at the apex of referral hierarchies and as centres of clinical training and knowledge-generation, teaching hospitals were not especially central in the study networks. Contrary to what one might have expected given the distribution of resources across the NHS, except in Small CHD Network the most central organisations were not mainly acute teaching hospitals.

Neither was the co-ordinating body especially central in the two small networks; it was more central to the three larger ones.

10 External links and openness

The research question on network openness was:

> RQ6a: How are member organisations within a network tied to organisations outside it, how are these relationships structured?
>
> RQ6b: What effect do these relationships have on how effectively member organisations use relational co-ordinating structures?

For outside links to have maximum effect on how effectively network member organisations use relational co-ordinating structures required, we hypothesised, that external relationships had a specific structure. Network members with external links would have also to have the internal links by which to transmit to other network members the knowledge and other resources obtained through links outside the network. For this transmission to occur by the most direct routes, the nodes with most external links would also have to have most internal links; the numbers of external and internal links per node would correlate. For the transmission of knowledge from outside the network to within it to be a managed activity, one would also expect the network co-ordinating body to have the highest numbers of external (and of internal) links. Then, as previously discussed, external links might have the effect either of enabling network members to acquire knowledge and innovations, and so decrease in hospital admissions preventable by primary-secondary care co-ordination; or the effect that professional interests and norms constrained or countervailed the networks' own goals, mandate or activity.

10.1 Structure of external and internal links

Every node in every network for which we had data had a negative E-I index. The E-I Index for each network node shows whether, and how far, its links outside its network outnumbered its links to other network members. A positive E-I Index means the network has more external than internal links, a negative score the opposite. Thus, every node reported more links within the network (to other network members) than to organisations or further networks outside it.

Network by network we calculated whether there was any correlation (Spearman) between the numbers of reported intra-network and extra-network links for each node. Table 23 shows the results.

Table 23. Balance between internal and external linkage

	Mean E-I Index	Correlation (Spearman) between numbers of nodes' internal and external links
Small CHD Network	-0.6738	0.00
Self-Care Network	-0.8426	0.42
Children's Hospital Project Network	-0.7643	0.46*
Urban CHD Network	-0.6191	0.53
Child Mental Health Network	-0.8675	0.12

** = Significant at alpha=0.05*

At a single-network level of analysis there was a significant correlation only in one network (Children's Hospital Project Network) between the number of internal links a member organisation had and the number of its external link. Taking all nodes together (across the networks) the mean E-I index was -0.7551, showing that internal links were considerably more prevalent than external ones. The correlation between numbers of nodes' internal and external nodes was 0.4281, which implies that at most only a small proportion (18%) of the variation in nodes' numbers of intra-network links could be explained by the variation in the number of extra-network links. Hence there was no strong evidence that, for member organisations, internal and external links were substitute (alternative) sources of innovations or other resources. Neither was there strong evidence that the presence of internal and of external links was mutually reinforcing (H6A).

10.1.1 Geographical scope of external links

Network members' participation in external committees was, not surprisingly, greater in local than regional, and greater in regional than national committees. The two networks which were care networks when the data in Table 24 were collected had no survey respondents who participated

in national committees or similar bodies. For care networks, liaison with other local organisations is of practical importance. Participation in regional and national policy-making bodies is almost superfluous for care networks, but directly relevant to the core processes of programme (commissioning support) networks. Since the project network was managing a city-wide project (in a large city) there was also a practical reason why it had as many respondents who participated in regional as in local bodies outside the network.

Table 24. Network respondents' external links

Network	Respondents with local external links N (%)	Respondents with regional external links N (%)	Respondents with national external links N (%)
Child Mental Health Network	17/42 (40%)	5/42 (12%)	0/42 (0%)
Children's Hospital Project Network	20/36 (56%)	20/36 (56%)	5/36 (14%)
City Children's Network	6/8 (75%)	3/8 (37%)	1/8 (12%)
Small CHD Network	2/5 (40%)	2/5 (40%)	0/5 (0%)
Regional CHD Network	No data	No data	No data
Urban CHD Network	19/39 (49%)	5/39 (13%)	2/39 (5%)
Self-Care Network	6/12 (50%)	0/12 (0%)	0/12 (0%)
Overall	58/122 (48%)	32/122 (26%)	7/122 (6%)

Two apparent explanations for the uneven distribution of national-level links outside the networks are:

- Size. By the law of large numbers the larger a network is, the more likely it is to include as individual members experts who participate in regional, national and international arenas for policy-making, professional or scientific work. Conversely, larger networks are more likely to be visible in regional and national arenas, and to attract the attention of (hence links with) policy-makers and professional leaders at those levels.

- Function. The practical activities of care-networks require essentially local resources (hospital or other beds; professional staff; community care), obtained or accessed through local rather than regional, national or international links outside the networks. Programme networks, whose tasks are dissemination and implementation of policy and knowledge, have the reverse pattern of resource dependencies.

However, Child Mental Health Network (a large network in terms of individual membership) had the same pattern of absence of national links as the small networks in sites D and G. On that basis, function appears a likelier explanation than network size for the absence of national-level links external to the networks.

10.1.2 Openness of the networks

Furthermore, networks' links to external bodies were not dependent on brokerage or mediation via the networks' co-ordinating bodies. Simple counts of their reported external linkages show which network members were most and least important as intermediaries between the study networks and other networks or organisations external to them. Table 25 shows the pattern found. (More than one entry in a cell indicates a tie.)

Table 25. Nodes with most and fewest external links

	Most links outside network	Fewest links outside network
Small CHD Network	Ambulance service	PCT
Self-Care Network	Mental Health Self-Help Group	PCT; community psychiatric centre; children's centre
Children's Hospital Project Network	Non-teaching hospital	Two non-teaching hospitals; community health services trust
Urban CHD Network	Network co-ordinating body (host PCT)	Five PCTs; two peripheral teaching hospitals; ambulance service
Child Mental Health Network	Local authority children's services	Health visiting service; eduational psychology; children's centre; parenting support service.

In only one network (Urban CHD Network) was the co-ordinating body the most important link to relevant bodies outside the network. With that exception, network co-ordinating bodies did not have any unique role as mediator between the network and health system 'outside' the network. In the other four networks, the co-ordinating body was in the middle of the

range in terms of numbers of reported links to bodies outside the network. The tendency of many (but not all) PCTs to have few external links was noticeable. We had expected that teaching hospitals would have the most links outside the network but this was not found in the three networks which included such hospitals. In Small CHD Network the ambulance service had the most external links because its representative was also a member of another, region-wide cardiac network.

In general, therefore, links within the network were, for most organisations, structured independently of their links outside the network, and in any event links within the network were more numerous, hence *prima facie* more important. The structure of links outside the network was not closely matched to the structure of links inside. Such a structure is better-adapted to the transmission of knowledge and other resources within a network than to the transmission of knowledge and other resources from outside the network to members within it.

10.2 External links as sources of knowledge

External links were used for knowledge-gathering, but only by a (large) minority of respondents. Our questionnaire asked respondents about what resources inside and outside the study networks they used to support innovation-related activity. This large minority used external evidence-based studies, external expert committees and comparative data in roughly equal proportions. External guidelines and site visits were less used (Table 26). There were no obvious difference of patterns of use of external knowledge between the different kinds of network.

Table 26. External knowledge sources respondents used in the previous 6 months

Network	Reviewed external evidence N (%)	External Committees N (%)	External data-sets N (%)	Visited other sites N (%)	External guidelines N (%)
Child Mental Health Network	22/42 (52%)	20/42 (48%)	17/42 (40%)	8/42 (19%)	20/42 (48%)
Children's Hospital Project Network	14/36 (39%)	17/36 (47%)	12/36 (33%)	6/36 (17%)	13/36 (36%)
City Children's	5/8 (62%)	5/8 (62%)	4/8 (50%)	3/8 (37%)	3/8 (37%)

Network					
Small CHD Network	3/5 (60%)	3/5 (60%)	2/5 (40%)	1/5 (20%)	2/5 (40%)
Regional CHD Network	No data	No data	No data	No data	No data
Urban CHD Network	8/39 (21%)	7/39 (18%)	8/39 (21%)	5/39 (13%)	7/39 (18%)
Self-Care Network	Incommensurable – see below				
Overall	52/130 (40%)	51/130 (39%)	53/130 (41%)	23/130 (18%)	45/130 (35%)

Self-Care Network requires separate explanation. Because it did not supply a clinical service, innovation-related activities oriented towards evidence-basing its working practices were not directly relevant to it. In Self-Care Network the main external knowledge links were health education events for the benefit of its members. Self-Care Network transmitted this knowledge (in condensed, accessible forms) from the diverse external organisations which had produced it over many years (universities, other researchers, WHO, NICE etc.) to their members. The Self-Care Network had no layer of links for the formal transmission of knowledge (no equivalent to publication of 'best practice' findings) but drew upon the direct experience and awareness of mental health problems from their users and the volunteers active in the three member organisations. Of our study networks, Self-Care Network was the most open to new membership, indeed depended on recruiting users to sustain itself. It also continually tried out new artefacts (see RQ8) for health promotion and related activities. It also sought out new sources of funding, including funding from NHS and local government commissioners.

The above findings enable us to decide between the two alternative hypotheses (H6Aa and H6Ab) as to whether external links complement or substitute for links within the network as a source of knowledge**:**

H6A: (Alternative hypotheses) Individuals with greater local, regional and national links outside the study network will have

a) more extensive links within the network (because they obtain resources from outside the network to share within the network).

Alternative hypothesis:

b) fewer links within the network because non-network links substitute for the network.

As reported above, the numbers of a member organisation's links internal to the network and external to it were associated only weakly, if at all. That pattern tends to support hypothesis 4A, but only weakly, and not alternative hypothesis H4B.

10.3 Occupational patterns of links outside the networks

At individual respondent level the EI indices for network members did vary by occupation but not in the way predicted. We had predicted:

> H6B: More strongly professionalised occupations (i.e. doctors) are more likely than other professions to have contacts outside the network (hence rely on the network less as a means of obtaining information; hence, be less engaged with network).

We therefore analysed the relationship between connectedness inside and outside the networks by respondent's occupation (H5) and by occupational group of the respondents' contacts with bodies outside (H6) their own organisation. The occupational groups were: Allied health professional; Doctor; Nurse; Secretarial / clerical; Manager; Social worker; Other. Since Self-Care Network was predominantly a user network, we counted 'users' as another occupational group (i.e. an occupation other than health professional). In the event no respondents described themselves as having a clerical or secretarial role so we excluded this category when analysing the data. Two informants of the 11 in the 'other' category were fitness instructors and two were teachers. The remainder were in roles that people of any occupation could fill, e.g. BME development worker. Table 27 shows the results.

Table 27. E-I index by occupation (pooled data)

Occupation	Mean EI Index
AHP	-0.96
Doctor	-0.77
Nurse	-0.78
Manager	-0.77
Social Worker	-0.83

Other profession	-0.79
Users (no profession in network context)	-0.85

The association between E-I index and occupation was highly significant (F = 7.25, critical F = 2.20, p=0.00). However the E-I index did not vary according to whether an occupation was strongly or weakly professionalised. Rather, it varied between two groups of occupations. The first group – doctors, nurses, managers and the 'other professions' - had higher E-I indices, i.e. were more likely to have links outside the network, than the second group (social workers, allied health professional and users) were. We had hypothesised (H6B) that more strongly professionalised occupations (i.e. doctors) are more likely than other professions to have contacts outside the network (hence rely on the network less as a means of obtaining information; hence, be less engaged with network). The present findings do not support this hypothesis. Whilst doctors were as predicted an occupation with relatively many links outside the networks, nurses (less strongly professionalised) and managers (not professionalised at all, in the senses that doctors are) had similar mean E-I indices. The allied health professionals, whose level of professionalisation is similar to that of nurses, had a significantly lower E-I index, as did social workers. We therefore reject hypothesis H6B. In any event all the occupational groups had strongly negative E-I indices; their links within the network were more numerous than their links to bodies outside the network. Even the occupations with higher E-I scores appeared to rely much more on the network than on external bodies for obtaining or sharing resources. Note that these results concern only links to external bodies which the informants attend in the capacity of a network member or representative. Insofar as number of links are a proxy for power or influence, this finding also tells against that part of H6 which predicted that links outside the network to professional networks are more powerful or influential than those within and through the study networks.

We also had predicted that (H6C) each profession is more likely to have contacts outside the network with fellow-professionals than members of other professions. This has the apparent implication (assuming that numbers of links reflect strength of influence) that links through professional networks are more powerful or influential than those through the study networks. To profile informants' contacts outside the network, we listed for each informant the non-network bodies she participated in at local, regional and national level. We coded these bodies according to whether they were uni-professional bodies (of the informant's own profession), multi-professional bodies or of an occupational composition unknown to the researchers (because the response did not make it clear). Pooling data

across the study sites, we collated the data by informants' occupation. We then calculated what we labelled a 'Uniprofessional-*versus*-Multiprofessional' ('UM') index of the balance between the numbers of each informant's links to uni-professional (her own profession's) bodies outside the network and to multi-professional bodies. When we calculated this index from data only about the external bodies on which the respondent participated in her capacity as a network member, we called the resulting figure her 'network-capacity UM index'. Table 28 shows the mean network-capacity UM index for each occupation.

Table 28. Occupation and network-capacity UM indices

Occupation	Mean 'Network Capacity' UM Index
AHP	-0.33
Doctor	-0.14
Nurse	-0.69
Manager	-0.82
Social Worker	-1
Other profession	-1
Users (no profession in network context)	-1

Taking all the occupations together, there was no significant association between occupation and network-capacity UM index (Anova, F=1.18, critical F = 2.19). This pattern persisted when we excluded from the analysis the three occupations (social work, other professions, user) with 10 or fewer respondents. Although the difference between the mean index for doctors appeared noticeably higher than for other occupations, a comparison of doctors with the combined set of AHPs, nurses and managers showed that this difference was not statistically significant either.

Besides the non-network bodies which informants attended in the capacity of network member, we also collected data about which uni-professional bodies (of the informant's own profession) outside the network they attended, irrespective of whether they represented their network there. When using these data we called the resulting UP index the respondent's 'personal capacity UM index'. Table 29 shows the mean personal capacity UM index for each occupation.

Table 29. Occupation and personal capacity UM indices

Occupation	Mean 'Personal Capacity' UM Index
AHP	-0.45
Doctor	-0.47
Nurse	1.18
Manager	-0.15
Social W	1.8
Other profession	0.87
Users (no profession in network context)	-1.00

There was no significant association between occupation and personal-capacity UM index (Anova, F=0.79, Critical F = 2.7) either. This pattern too persisted when we excluded from the analysis the three occupations with 10 or fewer respondents. In Table 29 the most apparent difference was between nursing (not medicine) and the other professions, but this difference was not statistically significant either.

Both the network-capacity and the personal-capacity UM indices tended to be negative; informants generally had more links to multi-professional than to single-professional (their own profession's) bodies outside the network. This pattern did not significantly vary by occupational group. These findings are evidence against hypothesis (H6C) that each profession has contacts outside the network with fellow-professionals rather than with members of other professions. They are therefore also evidence against the supposition that external links are the media for professional bodies outside the networks to control or constrain network activity. If it does occur, such control or constraint must therefore be effected by other means.

10.4 External links and innovation

External links had little relationship with innovation-related activity. H6D predicted that inter-group brokerage allows exchange of ideas. Networks with proportionately more external links, i.e. a higher EI index, would report higher level of innovation-related activity. At network level of analysis, there was no significant correlation (Spearman) between networks' mean EI indices and their mean innovation-related activity scores. Node-level

analysis showed either no significant correlation between EI index and innovation-related activity or a significant but negative correlation between EI index and innovation-related activities (Table 30).

Table 30. External linkage and innovation

	E-I Index (mean score)	Innovation Score (mean)	Correlation (node level) (Spearman)
Small CHD Network	-0.6738	5.75	-0.8*
Self-Care Network	-0.8426	4.83	-0.55
Children's Hospital Project Network	-0.7643	3.21	-0.29
Urban CHD Network	-0.6191	4.5	-0.61*
Child Mental Health Network	-0.8675	5.73	-0.35

** = Significant at alpha=0.05*

Our qualitative data showed (see RQ2) that by far the most important source, outside the study networks, of ideas for changing clinical practice or service configurations were national policy and guidance, that is the NHS networks' mandates. For the consequence of the mandates was that mandated networks became implementation structures rather than structures to promote 'bottom up' innovations. H6D is therefore not supported by the evidence of these study networks.

10.5 External links and referral patterns

No correlation at all was found between member organisations' E-I index (proportion of links outside the network) and the relevant referral patterns. Network openness to external links was not significantly associated with changes in the kinds of admission preventable by better primary-secondary care co-ordination in any of the networks for which we had both SNA and outcomes data. These data lead us to reject the hypothesis (H6E) that providers with more external links will have more up-to-date working practices, hence report between outcomes (in terms of admissions preventable by primary-secondary co-ordination).

10.6 Role of external links in the study networks

Since network members' external links tended to be fewer than their links internal to the networks, or absent, our findings about what effect these relationships have on how effectively member organisations use relational co-ordinating structures are largely negative. They suggestthe absence of effects and patterns of effective use of relational co-ordinating structure that studies outside the NHS might have led one to predict. Specifically

- Internal linkages were proportionately much more numerous, from which we infer important, to the networks than external links.
- External linkages were used as a way of gaining knowledge, but even in this regard network mandates were a most important influence on network objectives and activities (see RQ2), rather than other external links.
- Except for the mandate, inter-group brokerage as a source of external ideas or of innovation was not very apparent. Neither, mandate apart, did the network co-ordinating body act in any distinct way as a broker for external knowledge or innovations.
- Uni-professional external linkages that could act as a medium for the exercise of external professional power over the networks were generally weak or absent. But since NHS clinical occupations, and indeed networks, tend to be highly professionalised, professional links and discipline must operate through other channels than direct links between external professional organisations and networks such as those studied. Instead professional links and discipline may operate, for instance, through structures operating within, rather than between, the member organisations of the networks; or through structures at national level or outside the NHS. Our quantitative tests of H6B and H6C relied on taking the numbers and balance of links (e.g. the E-I index) as a proxy for the influence which internal and external linkages have upon network members. However it remains an open question whether, although fewer, professionals' uni-professional links are of a different quality and influence their practice more than their links inside an NHS-style 'clinical and professional' network do.

As previously, we interpreted network effectiveness in terms of innovation and avoidable hospital admissions.

10.7 Summary

The study networks' member organisations had relatively few links to bodies outside the network. Their links to other organisations within the networks

were more numerous and appeared stronger. The networks were not particularly open to external resources. Professional (in the sense of uni-professional) networks had little direct influence either. Such links outside the networks as were present tended to be with inter-disciplinary bodies rather than with (uni-) professional networks, though it should be borne in mind that our study focussed on links which our informants reported in their capacity as network members rather than in their capacity as members of a particular profession. Relationships to networks and organisations outside the study networks therefore appeared to have little perceptible effect on how effectively the member organisations used the study networks.

11 Incentives

On incentives, our research questions were:

> RQ7a: What effects are produced by incentives to cooperate (or not to)?
>
> RQ7b: What match is there between incentives and network structures?
>
> RQ7c: In NHS networks for example, how will the shifts to practice based commissioning and payment by results affect network processes?

11.1 Incentives and network structures

The match between incentives and network structures was investigated by SNA:

1. comparing the density, isolates and pendants of the links for money and the links for help-in-kind. This showed which type of 'motivational' or co-ordination link predominated in the network.
2. testing whether each link with a 'real side' content was matched by a link which transmitted money (in exchange) between the same pair of network members. This showed whether market-like exchanges of money for real-side benefits might be occurring.

By 'help in kind' we meant use, loan or sharing of equipment, premises, consumables, staff time, information and other similar forms of practical help.

The comparison between the financial and help-in-kind structures is already reported above (RQ5). In three networks, the help-in-kind layer was considerably and significantly more dense than the money layer. Help in kind was a more important medium of co-ordination than financial links in these three, hence a more important medium of co-ordination than financial incentives. In one programme network (Urban CHD Network) and the project network, the money layer were not significantly different in density. Where money is absent as a linkage medium at all, it must also be absent as an incentive. Hence financial incentives were less important than help-in-kind as a medium for collaboration in the three networks, and no more important than help-in-kind in the other two. The difference between the group of three and the group of two networks was neither in function nor care group, but in size. These were the same two networks that showed the

strong pattern of associations between internal links, external links and innovation-related activities reported above.

To explain the differences between these two patterns we turned to our qualitative data. Possible reasons why in these two networks the money-mediated links were as dense as the help-in-kind links were:

- Setting: Both relevant networks both served large urban populations. In general, direct links between members (density) were lower in these two networks. So a possible interpretation is not that money-links were more important in these two networks than elsewhere, but that help-in-kind links were less important because other kinds of direct contact were fewer. For in these networks there was less everyday working contact between organisations at the clinician and junior-manager levels than in the more localised care networks.
- Preponderance of NHS organisational membership, with its implication of common policy norms and performance management systems, does not seem a good explanation of the observed patterns. For these factors might be expected to make money links relatively less, not more, important as a linkage medium in the larger, mandated networks.
- The fact that the networks were mandated and co-ordinated by an NHS commissioner (SHA in one, PCT hosting a SHA-wide network in the other) which allocated substantial budgets and resources to supporting the network. Thus, money-links were relatively more important in these networks simply because in the other networks, the co-ordinating body (and perhaps other members too) could not bring much money to the network.

There remain three other layers (direct patient care; patient care administration; and general administration) to compare with the money layer. Table 31 shows the proportions of links in each network and for each network layer, where a 'real-side' link had a matched 'money-flow' link. The higher these proportions, the greater the role of financial incentives in the collaboration between network member organisations. The denominator in these fractions is the number of reported links, which reflects network density not the (much lower) number of network members.

Table 31 shows a a similarity across all four networks in regard to direct patient care, where the proportion of links in which direct money-incentives operated could not have exceeded 25% of the total (and because of our data-cleaning methods these figures are maxima; possibly the actual figures are lower). For patient care organisation and general administration there is an apparent difference between Urban CHD Network and the other four networks. On comparing the matrices showing the matched money-plus-

real-side links, we found that in three of the networks (Small CHD Network, Self-Care Network, Children's Hospital Project Network) none of these matched links involved the co-ordinating body and in the fourth (Child Mental Health Network) only two (out of 34) did. The matched links were between other member organisations, and showed no obvious pattern. Such links were also present in the atypical network but there, in addition, matched links were reported between the network co-ordinating body and every other network member organisation. In this network, therefore, it appears that the structure for financial incentives to operate was present. Even so, these money-mediated links distributed only monies allocated through the network (that is, in network Urban CHD Network from the co-ordinating body's own budgets for network co-ordination), not monies allocated through parallel (e.g. contractual) relationships outside the network. The latter transmitted amounts of money orders of magnitude larger than those transmitted within the study networks.

Table 31. Proportions of matched 'real-side' and 'money-flow' links

Network	Proportion of matched links in money-layer and layers for:		
	Direct patient care	Patient care organisation	General administration
Child Mental Health Network	27/616 (4%)	34/616 (6%)	34/616 (6%)
Children's Hospital Project Network	57/318 (18%)	63/318 (20%)	43/318 (14%)
Small CHD Network	3/25 (12%)	7/25 (28%)	4/25 (16%)
Urban CHD Network	23/93 (25%)	59/93 (63%)	70/93 (75%)
Self-Care Network	8/ 52(15%)	8/52 (15%)	5/52 (10%)

Similarly, in terms of density of layers, the contrast was between one network and the other four. In the group of four, the money-layer was substantially and significantly less dense than the other layers, and had more isolated and more pendant nodes (for details see RQ5).

In Child Mental Health Network the difference between the density of the money layer and the density of the other three layers was more than threefold and the differences were highly statistically significant. The structure of the financial flows differed markedly from the other network structures. Indeed the map of financial layer was a somewhat star-shaped network centred upon the joint commissioner and the new children's centre, whilst the other layer maps had a more web-like appearance. We therefore infer that financial flows played little part in the co-ordination of this

network. The money layer in Children's Hospital Project Network did not significantly differ in density from the administration layer. It was less than half as dense as the direct client care and client care organisation layers and this difference was highly statistically significant (p=0.0002). The latter two were the layers reported to be most important to the network's activities. In this network too, therefore, the structure of financial allocations did not closely match the rest of the network structure. In the small CHD network, the density of the money layer was less than half that of any other layer, and less than one-third that of the help-in-kind layer. All these differences except one were statistically significant at a level of p= 0.02 or below, and the difference in density between the money layer and the direct patient care layer was just below the declared threshold for significance (p=0.055, but p=0.02 for a one-tailed test). We infer that the structure of these flows differed markedly from the other network structures, hence that financial flows played little part in the co-ordination of this network either. Except for the administration layer, from which the money layer did not significantly differ in density, the money layer in Self-Care Network was less than a third of the density of the other layers, and the difference was highly statistically significant.

For the other network where data were available, these differences in density were not found. As for a structural match between the money layer (financial incentives) and the other layers in Urban CHD Network, there were no significant differences (in effect matching densities) between these layers except for direct client care. The money layer was denser than the client care layer, a pattern not found in the other study networks.

Across all the networks, the client care and client care organisation layers were the two most densely connected layers. There were no isolates in the direct client care layers; and only a single pendant in all five of the client care organisation layers. These two layers were the most connected. In three out of the five networks, the direct client care and client care organisation layers were closest in density, but not in the two programme networks.

Social network analysis thus suggested that financial incentives did not play a dominant role in co-ordinating the study networks. The case studies suggested why this was so.

Within some general policy guidelines, NHS network co-ordinators had discretion in how they used the networks' co-ordination budgets,:

The heart improvement team have financial responsibility …. the money comes from them and we then organise the network with that money so how we do that is up to us. … but each network can set itself up in how it wants because each network will then use that money how locally their directors [decide to] do it so the city tells us that they

want us to go and commission which none of the other city cardiac networks do. So we're all slightly different so how we use that pot of money is up to us.

(Network director, Urban CHD Network)

However NHS networks did not themselves finance their own core activity. Clinical care is notoriously costly. Such cost for care networks' care groups were met by the networks' member organisations themselves without any cash passing through the network's hands. Rather, payments for patient care were settled directly between their member organisations and the relevant commissioners through PBR, PBC and (residually) the earlier commissioning systems (see below). But the care networks did have a budget to pay for the co-ordinating body's co-ordinating work and (especially in Child Mental Health Network and Urban CHD Network) to make *ad hoc* grants and project payments to its member organisations. Even the co-ordination work however did not depend entirely on financial contributions. Programme networks produce rather intangible outputs requiring few inputs other than the time of the individual network members and office services (IT support, office space) which were also provided in kind by the networks' member organisations. Apart from the co-ordinators' salaries and office accommodation other inputs were with a few exceptions negligible in financial cost. Thus even the co-ordinating body's budget was relatively small except in the large project network and the largest CHD network. Programme networks' and the project network's budgets were likewise used mainly to support the network infrastructure. The costs and work of co-ordination (as opposed to the costs of care) were similar in the programme and project networks. They too did not directly control any considerable budgets for payments to network members. At most (Regional CHD Network), they were the most influential advisor to the budget-holders who did allocate capital development monies. Thus, even in the NHS network whose structure came closest to that required for direct financial incentives to operate within the network, the co-ordinating body could not rely heavily on financial incentives to co-ordinate the network because it did not control the most salient budgets or contract payments.

In contrast, the user-experience network did finance its own core, self-care activities. Its income was used to pay expenses for food or other consumables, travel and stationary costs for organising network events. These amounts were however modest, certainly not enough to pay financial incentives, still less a salary or contract payments, to any of its members. Indeed it took one of the two small voluntary member organisations some time to realise that the costs they bore from photocopying and other sundries (which a volunteer met from her own pocket) were legitimate expenses they could claim from grants to the co-ordinating body. At most, the latter reimbursed members' direct expenses for stationary or similar costs, or for food or other consumables for network events. Instead, Self-

Care Network also contributed to a local time-bank and skill-swap scheme as a mechanism for rewarding network members in kind (not money) for helping each other.

In summary, the network structures necessary for the co-ordinating body to apply direct financial incentives within and through the networks were largely absent in four of the networks for which we have data, and partially absent in the fifth. Even in the fifth network, though, linkages based on help-in-kind were equally prominent. Such financial incentives as did exist were project payments to enable the network members to take on new activities rather than personal incentives or fees to organisations. Inside all five networks financial incentives played only a marginal role as a medium of co-ordination. Help-in-kind (resource sharing) was more important, and it inherently tends to involve closer collaboration than financial transactions do (10).

11.2 Incentives to cooperate

The near-absence of direct financial incentives raises the questions: what other incentives, then, had the effect of motivating network members to collaborate? We answered this question by a qualitative investigation of networks' members' own accounts of why they participated in the networks i.e. what benefits they were seeking. The effects which these incentives produced, in terms of network artefacts and referral patterns, are described in the following chapter (RQ8).

Our case study informants suggested three main reasons: the prospect of practical benefits which would enable them to undertake clinical work more effectively; it was a requirement of their employment; and because participants found it personally rewarding to realise benefits for other network members and for patients.

Belief in prospective practical benefits to clinical work were most evident among CHD network members. When asked why people were motivated to join a CHD network interviewees commented

that's just what sensible people do to improve the service they provide for their patients, and it's a way to do that.

(Small CHD Network cardiologist)

There was an assumption here that participation by clinicians would lead to influencing the design and commission of local services. For network membership in general,

I think the only motivational, the main motivational factor is the old business about, what would you want if it was you, or it's your relative, what would you want to happen, and people know, when they're honest and they look at their systems that the

delays that are involved, the hand-offs that go on, we shouldn't be doing it, and I think those are the driving factors behind it [participation in the network], to do what's right, but sometimes, you see it occasionally, you see that staff sometimes think about what's best for them as far as the shift systems, their working patterns, what's best for them as opposed to what's best for the patient. And I think those are the biggest motivations.

(Ambulance rep, Small CHD Network)

Another informant in this network stated that his motivation to participate was that things 'actually get achieved', and that there was real, active cooperation between the member organisations rather then just token efforts at collaboration. Interviewees in Small CHD Network assumed that people were motivated to join a CHD network because 'that's just what sensible people do to improve the service they provide for their patients'. Similarly in City Children's Network an important motivator was a passion to do the best for local children. The same applied in another programme network, Regional CHD Network:

I really believe in the concept, I think it is a really good idea, and I think the people they have appointed thus far have got conviction and I think it could be a success, and that is why I am still very keen on doing it. I think if we can just engage the commissioners and understand what the network's for, then I think actually it will be an invaluable tool.

(Cardiologist, Regional CHD Network)

Informants often also told us that the value of network meetings lay simply in the linking of different organisations and viewpoints.

For the voluntary groups which were its member organisations, Self-Care Network was one means of furthering the services they can offer to local people and for strengthening their relationship with each other. Child Mental Health Network had a handful of individual members, some of long standing, who did not represent any organisation or profession, but just contributed out of a personal interest in developing mental health services for young children. For example, a consistently active health visitor member was included not because she represented anyone but herself, but because she had been a founder member of the network and well understood local child care organisations and their relationships. Some of the third-sector organisations which were network members also relied partly on volunteers.

Network co-ordinators were in a different position. The incentives and accountabilities of those employed in statutory organisations related to their work implementing national and local policy mandates. The individuals who held a network manager (co-ordinator) post were salaried, but the incentives which these arrangements set up – in this case, for making the network function effectively - were the same as for any other NHS manager. Standard NHS pay-scales and performance review arrangements applied. The same applied to a minority of medical managers; to cooperate through the network was simply part of one's job:

Oh it is, it is a kind of, it just feels like a compulsory thing.

(PCT public health doctor, Urban CHD Network)

A minority of informants said they found it rewarding to benefit other network members. Informants also saw more immediate practical benefits:

I think again what motivated me is I thought I may be able to share knowledge and support.

(Director of Public Health, Urban CHD Network)

In Self-Care Network, the members employed by statutory organisations were in part motivated by personal commitment and by the attitudes of professionals and service users. A PCT worker described her personal satisfaction and stimulation from working with the least-resourced member organisation with its responsive members and observing their personal growth, in addition to perceiving a public health benefit. Of two of the most active user-volunteers' drive and motivation she said:

Their motivation is so heart felt isn't it, and I just think they're got a sincerity that most professionals could never claim to have, it's just from the heart.

(PCT community development worker, Self-Care Network)

For the members of Self-Care Network, its activity was among other things a means of social contact and of strengthening their relationships with each other. Indeed, volunteers participated in this network even at some (practical) cost to themselves.

The partial exception to these patterns was Children's Hospital Project Network. Although the veto was never actually used, the powers which the secretary of state had given to the Children's Hospital Project Network were always present as a motivator in the background. These powers were an addition, not an alternative, to the patterns of incentive reported above.

Values such as improving patient care thus had a greater influence over network formation, membership and participation than financial incentives. The predominance and nature of the non-financial motivations differed only in detail between sites. This pattern of motivation made evidence-basing a persuasive motivator and unifying ideology of the NHS networks (but it was not relevant to the experience network).

Within the networks, financial incentives to collaborate were largely absent, so no effects can be attributed to them. The absence of these incentives meant that instead, networks were co-ordinated through non-financial incentives and motivators. The main non-financial incentives to cooperate were an ethos of improving services for patients and for high-quality care and clinical practice. Of the governance mechanisms noted above, prudent reciprocity (help in kind), technical persuasion (EBM) and – to the extent that information exchanges allowed – governmentality were all in evidence

in the study networks. Contractual and juridical mechanisms were not. The effects which these non-financial incentives produced upon network performance (artefacts and referrals) are reported under RQ8. Financial incentive structures outside the network did however have effects within the networks.

11.2.1 Practice based commissioning and payment by results

Extension of practice based commissioning and payment by results both called into question the roles, indeed the survival, of some of the study networks. Not only did these developments extend quasi-market governance structures, an alternative governance structure to networks (see chapter 1). Some of the study networks themselves became externally-commissioned much as (other) NHS providers were. The result was to shift networks' core processes from those of care networks towards those of programme (i.e. commissioning support) networks.

During the study period three networks were not much affected by practice based commissioning (PBC). For the other four practice-based commissioning consortia ('groups') constituted parallel, indeed alternative, commissioning networks.

The impact of practice based commissioning on the user-led Self-Care Network during the period of this study can swiftly be described. There was none. Members of one of the voluntary organisations in the network reported that in 2007 membership of group was low and there was a risk of the group folding. The rest of Self-Care Network helped prevent this by revitalising energies and helping get more people in. Although at the time of writing the group still needed new members the GP surgery was not referring anyone to them and the group said they felt a lack of communication between doctors and the group. This relationship was problematic. The group met in the GP surgery and took care of the surgery garden but did not get any financial contribution from the practice even though they requested it. Not even this practice, let alone others, used the mechanism which in theory PBC creates to pay the Self-Care Network for helping people with long-term mental health problems. Similarly, PBC and PBR had little effect on the care network for young children with mental health problems (Child Mental Health Network) because at the time of this study patient choice policies had not yet been applied to mental health services, and these services were not yet the prime object of attention for the practice based commissioning consortia in the city. The same largely applied to the city in which Children's Hospital Project Network worked. PBC consortia neither duplicated nor threatened its core activity. It took cognizance of likely local impacts of PBC on the services it was remodelling, but this signified at most relatively small adjustments to its wider service

re-profiling project. Where it was implemented, PBC had little effect (during the period of this study) on relationships between primary and social care members of the children's services networks.

Limited effects of PBC were more evident in the CHD networks Small CHD Network, Regional CHD Network, Urban CHD Network and CHD pilot site. Insofar as PBC was actually implemented (see below) there arose a parallel structure of networks (consortia of general practices) apparently to manage some of the same inter-organisational relationships that the care networks had been intended to co-ordinate, for PBC consortia would be an obvious home for a network-like approach to managing the problems of local service co-ordination across organisational boundaries. Granted, the PBC consortia focussed on commissioning and the study networks on referrals and clinical practice. But the rationale for a quasi-market, and in particular for primary-care based commissioning, is that commissioning decisions should reflect good referral practice and good clinical practice (51,203). At best one network would therefore be superfluous, and at worst the two networks might advocate different policies such as care pathways, although the spread of EBM reduces the likelihood of this. We found that in practice two facts mitigated these potential problems. In our study sites PBR implementation had generally been less extensive at the time of this study than policy-makers had anticipated, a pattern also reported elsewhere (204-206). Secondly, PBC activity tended to focus more on CHD than many of the services with which the children's services study networks were concerned.

Payment by results had essentially similar implications for the networks. For the children's services project Children's Hospital Project Network they were marginal, for the user-experience Self-Care Network they were non-existent, and for the CHD networks more immediate.

During the study period payment by results had only partially been implemented for the services involved in the children's services networks (City Children's Network and, especially, Child Mental Health Network) because PBR had not yet been extended to mental health services, the main focus of Child Mental Health Network's activity. For the CHD networks, the impact of PBR came partly through the connected policy of patient choice. In Urban CHD Network an effect of the patient choice policy was that there began to develop different referral patterns and routes than those the network had advised upon. For example, there was an increase in patients choosing referral to tertiary centres in the city centre even for relatively minor procedures, in contradiction to Urban CHD Network policy. Indeed, one consultant in the network also changed his employment arrangements, dividing his time between two sites, out of line with network policy. Because PBC and patient choice were also policy mandates (although NHS-wide mandates, not specifically for the network), the members of Urban CHD

Network felt they could not challenge them but would just have to accommodate these consequences of PBR and patient choice. Incipient conflict between the patterns of activity proposed by the networks and those emerging from the new commissioning systems were more immediately evident in the case of patient choice than practice-based commissioning. These problems were not reported in the other two CHD networks, although Regional CHD Network was out of action for much of the study period. The remaining CHD network served a population which, for geographical reasons, had a choice of just two hospitals for CHD treatment unless patients were willing to travel more than the 50km for planned treatment. Both PBR and PBC were intended to, and to some extent did, widen the range of service providers in the study sites. This created the problem, for networks, of how to respond to new-entrant providers who were not network members. This problem arose particularly in Small CHD Network when CHD care provision through Independent Sector Treatment Centres was extended. In City Children's Network different voluntary member organisations also found themselves competing for contracts from the same statutory commissioners. A similar phenomenon has been reported in US mental health care networks (207).

The study networks adapted in two ways to these changes in NHS commissioning. These responses can be regarded as the effects which PBC and PBR had on the study networks.

First, managers and policy makers responded by encouraging the networks (in our study, Small CHD Network, Regional CHD Network's antecedent CHD networks;CHD pilot site; City Children's Network, Urban CHD Network) to reconstitute themselves as commissioning support networks (i.e. a specific kind of programme network) with the consequences described above. In that way these networks could actively influence how PBC developed (in the areas of the network's interest) rather than just respond – or passively decline – whilst alternative, quasi-market governance structures developed alongside them. Thus the former care networks would advise the PCT(s) about commissioning, and the PCTs would feed this advice into their own and their local PBC consortia commissioning decisions. As a manager (dissemination conference participant) from a non-study site put it, networks would in future function as mediators for commissioning purposes; this was a distinctive and valuable new role because some PCTs and NHS providers were interpreting NHS commissioning policy, including PBC, as proscribing direct relational contacts between commissioners and providers. In future, clinical and professional networks would fill that role.

For the care networks this was (so to speak) a natural transition. Even before PBC and PBR they had relied partly on commissioner adoption of network policies and decisions to get those policies and decisions

implemented (especially in Child Mental Health Network and Small CHD Network). The care networks tried to influence PCT or SHA commissioning decisions and practice, and thus indirectly influence providers' clinical practice and service model. During their time as care networks this method of implementation was however ancillary to the more direct approach of influencing providers via their representatives in the network, with these representatives acting as 'boundary-spanners' transmitting network decisions into their own organisations' 'hinterland'. The effect of PBC and PBR was not to eliminate the latter approach but it did shift the balance towards the former. PCT, and therefore network, mergers had the same effect. Nevertheless the study networks did not all adapt willingly or with equal speed. Small CHD Network had tended to resist and delay this change. CHD pilot site network had recognised it and adapted after initial misgivings. Urban CHD Network had been, so to speak, an early adopter of this changed role and of our study networks was the one which had gone furthest in developing it, with Regional CHD Network following. Child Mental Health Network also responded radically, in effect sloughing off the membership and activity not directly germane to commissioning support into what might yet (the position remained undecided when this report was being written) become a care network functioning as a single networked care provider.

Second, NHS providers were exposed to the incentives of payment by results (PBR) and practice based commissioning (PBC), and to the policy mandates described above (chapters 5-6) irrespective of their network membership. Some of the networks adapted by helping provider member organisations achieve nationally-set targets to which other governance structures independent of the network had attached incentives and penalties:

there are no monetary incentives, we can't, we can't give them [those] but we can help them [providers] like for instance those who are not doing so well on 18 weeks [access time target], there are some real sanctions for them from other bits [of the NHS] if they don't achieve 18 weeks and at least if we can make sure cardiac achieve 18 weeks then that's one bit that they can tick the box for so I suppose there are incentives for using our staff for helping them manage.

(co-ordinator, Urban CHD Network)

One might describe this as the network harnessing external incentives to create an incentive for collaboration inside the network. The more powerful those external incentives, the stronger the reasons network members had for implementing network policies that would help the member gain those incentives. In principle a network could harness any incentives that bore powerfully upon its member organisations. A network could only harness external incentives to the extent that the latter were compatible with the network's own objectives. Where PCT chief executives had no explicit

targets (e.g. around children or partnership working) there were no powerful external incentives for the networks to harness. But since both the networks and their member organisations were subject to the same sets of NHS-wide policy mandates (see chapters 1,5,6) the external and internal incentives often did converge. Although it was most clearly reported in Urban CHD Network this harnessing mechanism is available to all NHS networks whose core processes might be of value to providers because of any ulterior incentive that is compatible with the network's own objectives.

However, external incentives also had some negative effects on a network's ability to implement its decisions. In Child Mental Health Network across the occupational groups (although not uniformly within each) our informants showed some reluctance to enter the 'dangerous territory' of diagnosing, providing or referring children for mental health care. This was partly because they were aware of the legal and administrative complexities of doing so, but more importantly because they were acutely aware of the stigmas attached to parent and child from such a step, and the opprobrium visited upon professionals who make serious errors in such decisions. The child P case, both the fate of the child himself and the repercussions for the Haringey organisations involved, made the member organisations in children's programme City Children's Network, and hence the network itself, become more cautious in proposing changes to services of the commissioning thereof.

Even when networks had evolved into commissioning support networks, it was sometimes argued that the new commissioning structures made the networks redundant. We were told an informant in a nearby CHD network (and by some of the network managers concerned) that SHA managers had expressed doubt about whether Regional CHD Network had any useful future. About six months after fieldwork finished, PCT mangers elsewhere took a similar view and closed down the commissioning-support remnant of Child Mental Health Network. Thus PBC and PBR both posed serious questions for the future of some of the networks studied.

11.3 External commissioning of networks

Another effect of the changes in commissioning policy was that some of the study networks themselves were drawn into the commissioning process as providers rather than as commissioner-support networks. By the end of the study period only two of the study networks were directly involved in care provision: the provider half of Child Mental Health Network and the user-experience Self-Care Network. Extension of the NHS quasi-market into primary care meant that these care networks now relied upon being commissioned by a PCT and/or local government. Although within the

networks financial incentives were absent, the incentives produced by external commissioning had the following effects.

Both Child Mental Health Network as a whole and some of its member organisations were now jointly commissioned by the local Primary Care Trust (PCT) and the city council. Short-term service contracts, project and policy 'initiative' funding meant that collaboration with local government and NHS commissioners became preoccupations in a hitherto mainly practice-oriented network. The network commissioned formal evaluations and began collecting data to legitimate its activities and recent impacts (e.g. the aforementioned children's centre). More formalised, documented self-definitions of the network, its remit and working practices began to appear. When the kernel of Child Mental Health Network separated off as a commissioning support network, it continued to develop some of these artefacts (e.g. care pathways).

Whilst future development of Self-Care Network depends on gaining funding from external commissioners, the largest member organisation was anxious about the impact of tendering and its effect on continuity of service provision, having seen services elsewhere disappear because of tendering. They thought that tendering was divisive; it might work with waste collection services but not services for vulnerable people. Commissioning systems had strained relationships between the council and the third sector in the past. For instance the main co-ordinating network for voluntary bodies in the city had lost its contract. The network therefore began discussing with the city council whether they could be exempted from the requirement to tender competitively for further funds. Nevertheless the largest member organisation of Self-Care Network made a two-year contract, with the City Council under the Supporting People programme. The contract stipulated that the voluntary organisation would deliver, through Self-Care Network: four drop in services a week for 12-15 people per session; two art sessions a week for three people per session; one cookery class for four people each week; 14 minibus trips a year; and four exercise events a year.

It also stipulated the collection and reporting of some basic performance data, and led to closer and more frequent contacts between the network and the city council than before. A PCT informant predicted that becoming a commissioned provider would change the dynamics of Self-Care Network. Currently 'what makes all those groups successful is that they're driven by people who are passionate about what they're doing' (PCT worker, Self-Care Network). City council managers are also aware of this possibility, and have therefore preferred 'light touch' commissioning; the council do not take an active role in running, organising or closely monitoring Self-Care Network activities. The council also made a workforce development grant to increase

the skills of the main member organisation's staff in order to develop Self-Care Network and similar services. The council also made small grants to the two smaller member organisations to fund trips and activities. Whilst the council did not expect the same kind of relationship as it enjoyed with the main member organisation to develop with these other two member organisations, the council did see the value of making small grants to all voluntary groups working to promote social inclusion, mental health and physical well being.

The Public Health Development Unit (of the PCT) helped the three non-statutory member organisations to set up the pilot and helped secure a £5,000 grant from the National Institute for Mental Health in England (NIMHE) 'Let's get physical' initiative, to assist the network's participation as a Lets Get Physical pilot scheme. One might have predicted that external funding by NIMHE would make Self-Care Network dependent upon accepting the concomitant mandates. However the funding was relatively small and (we were told informally) the network members largely ignored NIMHE guidance. Within Self-Care Network, which had hitherto produced almost no substantial managerial documents, a tangible effect of seeking this funding was the creation of their first (managerial) artefact which was markedly atypical of that network's impacts in general. Self-Care Network later completed a long and complex (but unsuccessful) funding application to the National Lottery.

In both these networks, participation in commissioning produced a formalisation of the networks' management (e.g. evaluations, documentation of activity). The networks became more dependent on professional and managerial help in dealing with the commissioning system. External commissioning thus had a bureaucratising effect on the networks which were already – or wanted to become more – publicly funded, especially upon the voluntary 'third sector' network.

The effects of payment by results and practice based commissioning were to realign the study networks' functions and activities. NHS managers in three study sites interpreted these policies as requiring networks either to become commissioning support networks; or to be regarded as a networked provider and therefore to be commissioned much as a (single) provider-organisation would. Commissioning policy changes created incentives outside the networks which network members could exploit within the networks (see RQ6), but which also threatened to duplicate the networks' activity or even make the networks redundant. Paradoxically, the new models of commissioning made the NHS networks both more powerful and less necessary as agents of their local PCTs.

11.4 Summary

Network members' main incentives to cooperate were the expectation of practical help-on-kind and the persuasive power of evidence-based practice which appealed, in the NHS networks, to the individual members' intrinsic motivations and professional interests. Financial links and therefore incentives played little part within the networks. Network co-ordinators were however able to 'harness' the more powerful targets and incentives originating outside the networks. These external incentives originated partly from payment by results. At the time we collected data, practice based commissioning had had little effect on the study networks.

12 Performance

Our last research question was:

> RQ8a: What determines the performance of mandated and non-mandated network structures?
>
> RQ8b: Are there systematic differences in the performance of mandated and voluntary networks?

We interpreted RQ8(a) as a general question about what the determinants of network performance are in general and RQ8(b) as asking what distinguishes the determinants in mandated and voluntary networks. We defined network performance in terms of intermediate artefacts and of apparent impacts upon the increase (or decrease) in volume of referrals preventable by close primary-secondary care co-ordination. The non-availability of policy-outcome indicators for certain kinds of network has already been noted. Such outcome indicators and SNA data were available for three of the study networks. Against this, two sets of indicators (AHRQ and Closer to Home) were available for the Children's Services Projects Network. In the latter case we first analysed the combined data for both indicators, then the data for each set of indicators separately. We only report findings from the separate analyses where they differ from those for the combined data.

12.1 Connectedness and performance

A fundamental test of the impact of networking was to test (H8A) whether more intensively networked providers (both hospital and primary care trusts in their provider capacity) would have superior service outcomes. That is, whether organisations with more numerous links to all organisations in the rest of the network (i.e. higher 'degree') will report better outcomes in terms of admissions preventable by primary-secondary care co-ordination. Data from Urban CHD Network support this hypothesis. On the Spearman test, the association between actor degree (the number of links to other network members which a given member organisation had, whether measured in raw or normalised (percentage)) terms, was strongly correlated with declines in admissions preventable by primary-secondary care co-ordination ($r = -0.81$). Around 64% of the variation in these admissions was associated with variations in organisation connectedness. A similar but more moderate correlation ($r = -0.56$) between actor degree and declines in admissions preventable by primary-secondary care co-ordination was also found in the Children's Hospital Project Network. In Urban CHD

Network but not Children's Hospital Project Network, fall in referrals was also correlated with what we have called the 'depth' or multiplexity of links: that is, the decline in referrals was greater, the more 'layers' of link existed between a given member organisation and the other member organisations. These Children's Hospital Project Network findings emerged when we tested the combined referral data for the AHRQ and the Closer to Home indicators. The association between referrals and actor degree was just below the threshold for significance when we repeated the test using the AHRQ indicators alone.

Against this, the Small CHD Network's larger, better connected hospital achieved a smaller reduction in admissions preventable by primary-secondary co-ordination than did the smaller hospital with fewer links to its local CHD network.

When we made a basic OLS regression analysis of pooled data across the three networks for which both outcome and SNA data were available, actor degree showed only a small correlation with changes in referral rates and in the opposite direction to that predicted. We conjecture however that this finding may partly be an artefact of merging data from one network with strong correlations with data from a larger network with weaker correlations; and of the use of multiple regression analysis which makes stronger assumptions about data properties than the Spearman test does. The latter is more likely to be valid for tests where – as in the present study – there are relatively few data-points and the data are not necessarily parametric. On balance we conclude that our findings are evidence, albeit equivocal evidence, for cautiously accepting H8A.

More specifically we hypothesised (H8C) that outcomes should be best when each member organisation relies on a few strong relations for most of care delivery whilst a few weak ties are maintained for information search. The 'stong+weak' for an organisation was scored as 1 if a quarter or fewer of that organisation's links to other organisations were 'strong', meaning that the organisations were linked on at least four of the network layers previously discussed, and the rest of its ties to other organisations were not. In three networks we were able to test the association of this 'strong+weak' variable with proportionate changes during the study period in admissions sensitive to primary-secondary care co-ordination. In Urban CHD Network, no significant association was found ($r = -0.44$, NS at alpha = 0.025). A significant association was found in Children's Hospital Project Network, but in the opposite direction to that predicted ($r = +0.51$, alpha = 0.025). Testing the AHRQ indicator data on their own showed no association. All organisations in the Small CHD Network did not differ in their 'strong+weak' score. A regression analysis pooling data across the sites also showed no correlation between that score and rate of change of the relevant

admissions. We therefore conclude that, in the study networks, a combination of a few strong with many weaker links is not correlated with network effectiveness in the senses defined for this study. H8C is not supported by the data from the study networks.

We also had predicted (H8D) that teaching hospitals will report better outcomes in terms of admissions preventable by primary-secondary co-ordination (because their links to academic medicine will result in more up-to-date and evidence based working practices, including those which allow stronger primary-secondary care liaison and integration of services to allow substitution). The hypothesis that, being more widely networked outside their local clinical and professional networks, teaching hospitals would be more effective (in the terms defined for this study) was not testable in Urban CHD Network because all the hospitals there had been designated as teaching hospitals during the study period. One hospital in the Urban CHD Network was a long established (19th-century) teaching hospital, whereas the others had been so designated only in the past 10 years, and it did have a noticeably greater reduction (56% over four years) of co-ordination-preventible admissions than the others (in the range 13% to 24%). Because there was only one old teaching hospital, this was not a statistically testable pattern. Another study in another site would be needed to test this hypothesis more thoroughly.

As a concomitant of finding that organisations with a high degree of linkage to other member organisations appear also to be the most effective at reducing co-ordination-sensitive referral, one would expect to find that these organisations are also more central to their network (hypothesis H8G). Examining the relationship between connectedness and the aforementioned types of referral it transpired that in Urban CHD Network, reduction in these avoidable referrals was significantly and quite strongly associated with:

1. normalised degree centrality (what proportion of the theoretically possible links a given organisation actually has): r= -0.74)
2. normalised reach centrality (how directly member organisations are linked to one another): r= -0.81)
3. normalised flow centrality (proportion of indirect links between other member organisations that involve a given member organisation): r= -0.73)
4. normalised flow betweenness centrality: r= -0.67.

These was no such association between the changes in those referrals and either betweenness centrality (on Freeman's measure) or brokerage. Also in the Children's Hospital Project Network the rate of decline of the relevant

referrals was moderately but significantly associated with reach centrality (r= -0.57) and with (normalised) flow betweenness centrality (r= -0.59). Against this, changes in admissions in the Children's Hospital Project Network were not associated with normalised degree centrality, (normalised) Freeman betweenness centrality or with (normalised) flow centrality. That finding may reflect the more moderate correlation between connectedness ('actor degree') and referrals in the Children's Hospital Project Network compared with the Urban CHD Network. The association between referrals and reach centrality degree was just below the threshold for significance when we repeated the test using the AHRQ indicators alone, but the association between referrals and Freeman's betweenness centrality was now significant (r= -0.58) (in contrast to the tests using the combined data for both indicators). Otherwise, the patterns of correlations were unchanged. The changes in patterns of association that occurred when we separately tested the data for the two sets of indicators suggest that the tests were sensitive to the relatively small numbers of data-points in our SNA data-set. Nevertheless, a consistent pattern of moderate support for hypothesis H8G emerges.

A basic OLS regression analysis of pooled data across the three networks for which both outcome and SNA data were available showed that whilst actor degree was correlated with changes in referral rates, the correlation was small and in the opposite direction to that predicted. However the correlation between referrals and flow betweenness centrality was both small and in the predicted direction, that between referrals and reach centrality was moderate and in the predicted direction. This is evidence, although weak, that changes in referral patterns reflect member organisations' centrality in their network. (Actor degree is another matter.)

Brokerage was associated with falls in the selected admission rates in neither the Urban CHD Network nor the children's project network, although in the latter a significant association (r= -0.62) between normalised brokerage and referrals did appear when we tested the data for the AHRQ indicators separately from the data for the Closer to Home indicators. As previously noted, the observed measures of brokerage were all low; brokerage played little part in the study networks. In none of the study networks was there any association between the referral changes and power (Bonacich measure). The Bonacich measure of power measures how far organisations which are highly-connected are also connected to other organisations which are not highly-connected (hence, depend on the first organisation for links to the rest of the network). This condition also did not generally obtain in the study networks.

These patterns of association and non-association are mostly as one would predict if, in a non-hierarchical network, the connectedness of member

organisations were indeed associated with reductions in referrals susceptible to primary-secondary care co-ordination. On balance they give weak, somewhat equivocal support to the hypothesis that organisations which are more central to the network will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

As the converse of some of the above hypotheses about connectedness and centrality, we also hypothesised that (H8B): simpler (whole) networks with fewer interfaces are more likely to succeed (In terms of our chosen outcomes) than complex ones. To test this hypothesis, we compared the number of network interfaces (measured by the number of links present) and the proportionate change during the study period of admissions avoidable by primary-secondary care co-ordination, the latter calculated for the network as a whole. Since both sets of data were only available for three networks we made a direct, non-statistical comparison of the data. The observed pattern did not support hypothesis H8B. The smallest network (Small CHD Network), which was also the most dense, had a growth rate for referrals avoidable by primary-secondary care co-ordination in between the rates for the other two networks for which relevant outcome indicators existed.

12.2 Hinterlands and key actors

The association between connectivity and referral rate changes raises the question of what mechanisms within network member organisations are involved. We hypothesised (H8E) that organisations with an internal climate favourable to collaboration between professions and between organisations will report better outcomes in terms of admissions preventable by primary-secondary co-ordination. This hypothesis received some support in the largest CHD network. In Urban CHD Network we found a significant association between our measures of climate in the member organisations and the change in referrals (to or from them) susceptible to primary-secondary care co-ordination. Half the variation in such referrals was associated with variation in the respective climate score ($r= -0.72$, $R^2 = 0.52$). However the hypothesis was not supported by the data from the Children's Hospital Project Network project network, where no significant relationship between climate and referrals was found.

No correlation at all was found between innovation-related activity and reduction of admissions preventable by primary-secondary care co-ordination. Data from our study sites did not support our conjecture (H8F) that organisations with high levels of innovation-related activity will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.

Conceivably some innovation-related activities but not others are associated with reductions in referrals susceptible to primary-secondary care co-ordination. We therefore tested whether each innovation-related activity, taken separately, was associated with reductions in those referrals. At the level of individual innovation-related practices some correlations did emerge in Urban CHD Network , but only for participation in committees (both inside and outside the member organisation) that were evaluating and modifying service delivery and processes ($r = -0.61$ and $r = -0.85$ respectively). Analogous associations were found for site visits to other organisations to see how they organize service delivery and processes and for dry runs to try out new ways of providing services (for both $r = -0.75$). (The negative values appear because we were testing whether innovation related activity would tend to reduce the level of preventable admissions.) However it should be noted that the number of data-points was small, so these findings should be taken with caution. Other innovation-related activities were not significantly associated with changes in the referral rates studied. The presence of the associations that were found raised the question of whether these innovation-related activities, at least, were associated with network connectivity. However, the correlations were either absent or negative, so we conclude that no such correlations existed. No correlation between any of these innovated relation activities and referral rates was found in the other two networks.

Together the above findings raise the questions:

1. Was the correlation between connectedness and referral changes evidence of causality, or was network connectedness a marker for some other characteristics of member organisations that really was the cause of the fall in preventable referrals?
2. If network connectivity did reduce the volume of referrals avoidable by good primary-secondary care co-ordination, through what mechanism did this occur if not through the innovation-related activity, moderated by organisational climate?

An obvious response to the first question is to consider whether connectedness was a marker for mandated status, which was really the cause of the changes in referral levels.

12.3 Performance: mandated versus voluntary networks

Previous sections explained that we found systematic differences between mandated and voluntary networks in terms of:

1. What the networks performed. In mandated networks, national policy targets replaced internally generated goals as the objectives of

network activities, although both kinds of networks included implementation of 'best' evidence-based practice.

2. Harnessed Incentives. Policy mandates imposed on the networks the same targets that their member organisations faced severally. The corresponding incentives and targets operated outside the networks and in parallel to them. The study networks were able to 'harness' these external, parallel incentives and targets by offering member organisations the incentive (for engagement with the network) of help in satisfying these targets. Then policy mandates were implemented in a dual way: through the network and through the internal line-management regimes of the member organisations.
3. Infrastructure available to support network co-ordination tended to be greater in mandated networks because these could call upon dedicated resources from the network's host PCT or SHA.

However the mandated networks in this study did not show significantly greater internal connectivity than non-mandated ones did.

Since whole networks were mandated (or voluntary), only between-network and not within-network comparisons were available as evidence of whether mandated status made a network more or less likely to be effective in terms of the kinds of preventable admissions we had measured. The three networks for which the relevant outcome data existed were of interest because one was voluntary at the time of the study, one was mandated in the usual way (its host PCT and member organisations all subject to common national policy mandates) and one mandated in a special way, possessing special powers delegated by the secretary of state. However we saw no difference between the mandated and voluntary networks. The voluntary network showed a rate of change in the relevant referral rates in between the rates for the two mandated network. We therefore do not conclude that the differences in the method of mandating contributed to the differences between these referral rates in the other two networks.

It remains to explain the process by which that occurred, since innovation-related activity seems to have played little part. Another line of enquiry is therefore to consider what the networks actually did; that is, what artefacts they produced and transmitted into their member organisation so as to change the behaviour change on key actors in their local health economy. The requisite artefacts differ, for different types of health network (see chapter 2).

12.3.1 Artefact production

Appendix 8 lists the artefacts which each network reported to us, showing which network function (from the list proposed by Southon et al.) each

artefact is relevant to and whether the artefact was practical, symbolic or both. Only activities reported to us as completed by the end of fieldwork (late 2008) are shown, not planned but uncompleted activities. We counted the regional transfer centre in Regional CHD Network as being (also) a symbolic artefact because of the way in which it was publicised. However appendix 8 does not differentiate artefacts made by the networks and any which each network subcontracted an external body to produce to the network's requirements (e.g. research on the evidence base for care pathways in Child Mental Health Network, consultancy support for public consultations in Children's Hospital Project Network, an information system in CHD pilot site). Appendix 8 counts revision of national services to local conditions as both practical (for its intended influence on clinical practice) and symbolic (because it demonstrated the network taking local control of how the guidance was interpreted, and showed the network putatively 'adding value' to national guidance). Similarly, training and education events had both a practical use and symbolic ones of demonstrating the value of the network and promoting its policies and culture. The same applies to artefacts produced in order to comply, or to demonstrate compliance with, external mandates (contractual obligations; national policies and targets).

Until c.2007 artefacts from Child Mental Health Network were conspicuous by their absence. For instance, there was no statement of the network's remit and few written working procedures. Although by the end of the study period, Regional CHD Network had produced quite a large number of artefacts, similar to those which other CHD networks had produced, it was noticeable that these artefacts had appeared at the beginning and the end of the study period, with a long interruption in the middle whilst the PCTs and SHA involved were restructured. Elsewhere, interruptions to the networks' core activity (processes) were much less evident.

Condensing appendix 8, Table 32 shows which network functions (and sub-categories thereof) each study network produced artefacts typical of.

Table 32. Functional classification of study networks' artefacts

	Children			CHD				Self-care
Site	**A**	**B**	**C**	**D**	**E**	**F**	**Z**	**G**
Function as referral (care) network								
Revisions to existing working practices (e.g. clinical guidance, demand management, resource reallocation)	•	•	•	•	•	•	•	•
New kinds of services (including pilot projects)			•	•	•			•
Changes to care-giving staff (e.g. recruitment, training, deployment)	•	•		•				
Information materials provided by providers to patients (e.g. health promotion materials, websites)		•		•	•			•
Function as experience network								
Mutual assistance activities (e.g. accessing or dealing with formal health services)								•
Patient information materials assembled by patients or informal carers (e.g. health promotion materials, websites)								•
Therapeutic provision (including pilot projects)								•
Function as programme network								

Changed service specification (e.g. quality standards, new care pathway)	•	•		•	•	•		
Recommendations to commissioners / planners		•	•	•	•	•		•
Changed financing or incentives (e.g. new contracts)	•		•		•		•	•
Formal evaluation of network (including patient surveys)	•						•	•
Function as project network								
New physical infrastructure (e.g. buildings, IT systems, transport)	•	•		•	•			
Project management (e.g. schedules, costings)		•						
Response to major public health events or crises		•						
Interest network								
Policy statements (e.g. policy documents, briefings)								
Campaign activities to promote single-issue policy								
Function as expertise network								
Training of professionals	•	•		•	•	•	•	
Benchmarking of current practice				•	•		•	

Disciplinary activities (e.g. ethical codes, penalising deviant members)					
Research	•		•	•	
Policy statements (e.g. policy documents, briefings)					
Campaign activities to promote professional interests					

Table 32 shows presence, not the quantities, of artefacts of each kind. It elides, for instance, the fact that the Self-Care Network produced a number and variety of pilot projects for patient care which easily bore comparison with the other, often much larger and in every case better-funded networks. In that network the balance between service changes and intangible artefacts was markedly towards the former. In that sense we did find that smaller, simpler core processes are more likely to work effectively than more complex or extensive ones (168).

Statistical comparison of artefact production across the networks would be spurious because the numbers are (for statistical purposes) small and the term 'artefact' is broad, covering intangibles such as decisions and knowledge, physical objects ranging from leaflets to buildings. It also covers both simple and complex outputs in all these categories. Nevertheless some gross patterns appear.

None of the networks failed to produce artefacts of the kinds which, given their stated objectives and hence functions, one would have expected them to produce. All the programme networks produced artefacts in at least one of the sub-categories attributable to programme networks, and so on. Indeed the networks produced a plenitude of artefacts. For each network also produced artefacts relevant to other functions besides its main function. Networks which described themselves as being in effect programme networks (even though they did not use the word) also produced artefacts typical of referral networks (e.g. revisions to working practice in existing services), artefacts typical of expertise networks (e.g. professional training) and even (but to a lesser extent) artefacts typical of project networks (above all, new infrastructure). The project network also produced artefacts typical of referral, programme and expertise networks, and the care network artefacts typical of programme, project and expertise networks. The experience network produced artefacts typical of referral networks (e.g. it distributed health promotion materials produced by health care providers) and of a programme network, although nothing typical of a project network.

We infer that this pattern reflects the networks' history of originating as care networks, then through mandate and merger acquiring the role of programme networks (or, for the project network, originating as a project network but then being mandated to function additionally as a care and as a programme network). In terms of artefact production, there was a sedimentation of activities from the different health policies which had been mandated during the networks' life. In practice, however, these different patterns of artefact production were not 'messy' to the extent of frustrating one another.

Only the CHD networks undertook benchmarking. We infer that this difference reflects the stronger evidence base and data availability for CHD treatment than for the other care groups, not the operation of any mandate. Contemporary policy documents, above all the National Service Framework for coronary heart disease, described benchmarking as desirable in the future but, pointing out the technical obstacles, did not mandate it. This benchmarking was also the only artefact produced by mandated, but not by voluntary, networks. The only category of artefacts produced by voluntary but not mandated networks were the artefacts typical of an experience network. It was hardly surprising that the user-controlled experience network produced such artefacts, but striking that no other networks did despite their overlapping ranges of artefacts of other kinds. We therefore find that the hypothesis that mandated networks produce a more limited (narrower) range of activities (hence artefacts) than non-mandated networks (H8H) is supported, but only in a narrow sense. The experience network produced some artefacts typical of the other kinds of network, except the project network, but the converse was not true. No other network produced the kind of artefacts typical of an experience network. In the same narrow sense, our findings also support the converse hypothesis that voluntary networks show more flexibility and openness to innovation (both organisational and technical) (H8J). However, the user-experience network's artefacts were invented or promoted by grass-roots enthusiasts rather than introduced by boundary-spanners across structural holes within and between networks (113).

Artefacts were predominantly practical rather than symbolic (or both symbolic and practical). Whilst the voluntary networks did produce symbolic artefacts, so did the mandated networks and the voluntary networks did not produce symbolic artefacts in obviously greater proportions or quantities. We thus found no support for the hypothesis (H8I) that voluntary networks are more likely than other networks to produce symbolic artefacts (163,164). Furthermore, our findings challenge as empirically simplistic any assumption of mutual exclusivity between network artefacts' practical and social functions, or that network artefacts have either a practical or a symbolic character. It is not only that the same artefact (e.g. a patient information leaflet bearing a network logo and name) can serve both practical and symbolic purposes at once; nor that the same artefact (e.g. an exercise class) can serve both practical and social purposes at once. Self-Care Network expressly defined one its practical functions as being to provide social contact between its members; and another as being to re-define its members' self-image. These are symbolic, 'non-rational' social outcomes.

Network artefacts were predominantly what we have called 'intermediate' artefacts. They were such things as technical guidance and software,

intended to influence the behaviour of key actors outside the network. In the NHS networks, only a minority of artefacts directly changed what services were provided and what physical resources were available to patients and health care professionals. The Self-Care network showed the opposite pattern. Its artefacts were nearly all direct services to its members, who were also service users, and these artefacts were mainly ones which would have a direct impact on health and self care (e.g. exercise groups, days out, cookery classes).

12.4 Network layers and artefact production

Patterns of artefact production also provide a further test of the association between network effectiveness and connectivity in networks (i.e. greater network density and greater 'degree' of nodes within networks). According to our theoretical model, artefacts are the intermediate network products which stimulate key actors in the networks' hinterlands to make the service (or other output) changes that produce the networks' intended outcomes. Because network artefacts are collective products it is not possible to correlate numbers of artefacts with the characteristics (e.g. degree, centrality) of single member organisations. However it is possible to report, network by network, which layers were the most dense; the function of each layer (in terms of the Southon et al typology); which functional categories of artefact each network produced most and least of; and hence whether the most dense layer(s) were also the most productive of artefacts. Table 33 makes the comparison.

Table 33. Layer density and artefact production

Network	Density of layers (descending rank)	Categories of artefact (descending number of artefacts)	Densest layer produced most artefacts?
Child Mental Health Network	1=. Direct client care 1=. Client care organisation 3=. Administration 3=. Help in kind 3=. Money	1. Referral-related 2. Programme-related 3=. Expert-related 3=. Project-related 5. Experience-related	Y
Children's Hospital Project Network	1=. Direct client care 1=. Client care organisation 3=. Administration 3=. Help in kind 3=. Money	1. Project-related 2. Referral-related 3. Programme-related 4. Expert-related 5. Experience-related	Y (see comment below)

City Children's Network	No data.	1=. Referral-related 1=. Programme-related 3=. Project-related 3=. Expert-related 3=. Experience-related	?
Small CHD Network	1. Client Care Organisation 2. Help in kind 3=. Direct client care 3=. Administration 5. Money	1. Referral-related 2. Programme-related. 3. Expert 4=. Project 4=. Experience	Y
Regional CHD Network	No data	1. Referral-related 2. Programme-related 3=. Expert 3=. Project 5. Experience	?
Urban CHD Network	1=. Direct client care 1=. Client care organisation 1=. Administration 1=. Help in kind 1=. Money	1. Referral-related 2. Programme-related 3=. Expert 3=. Project 5. Experience	Ambivalent
Self-Care Network	1=. Direct client care 1=. Client care organisation 3=. Administration 3=. Help in kind 3=. Money	1. Experience-related 2. Programme-related 3=. Project 3=. Expert 3=. Referral-related	Y (see comment below)
CHD Pilot Site Network	No data.	1. Referral-related 2. Programme-related 3. Expert-related 4=. Project 5=. Experience	?

The rankings of layer densities ignore statistically insignificant differences of density (see RQ5). Our qualitative evidence suggests that the project-related artefacts were produced and distributed through Children's Hospital Project Network through the same layers of links (to the same people, at the same times, for the same meetings, by similar media) as its programme-related artefacts. The client care organisation layer in Children's Hospital Project Network thus generated both the project and the programme artefacts, making it easily the most productive network layer.

Layer densities did not significantly differ in Urban CHD Network, so the finding for that network is ambivalent. Since Self-Care Network was a self-care network, it used experience-related artefacts (not referrals) for direct client care. These artefacts were produced and distributed through its direct client care layer of links, and the latter was its densest layer. We therefore conclude that for four of the five networks where we had data, the densest network layer was the most productive of artefacts, hence that network connectivity was in that sense associated with network effectiveness. That said, two caveats apply. 'Numbers of artefacts' is a crude measure, counting a new, staffed building equally with a short policy document. Although one layer tended to produce the most artefacts, the NHS networks were nevertheless multi-functional in terms of the artefacts they produced. The independent experience network came close to being a single-function network.

We therefore infer that the production and transmission of artefacts to key actors within their member organisations is the apparent explanation of how networks contributed to producing the observed changes in admissions and the other observed service changes. member organisations, and key actors within them, made use of these artefacts for three main reasons. One was the persuasive legitimacy of evidence-basing practice, an activity which many of the network artefacts embodied. A second was that the networks provided help-in-kind (practical help) in meeting the targets and incentives that their members, both organisations and individuals were exposed to independently of the network. That is, the network artefacts were harnessed to parallel incentives that (thirdly) operated outside the networks themselves. This explanation fits our data better than our original hypothesis that networks helped to stimulate innovation-related activities within their member organisations.

12.5 Summary

Voluntary and mandated networks differed in terms of some of their objectives and core activities (i.e. what the networks performed). These differences reflected the occupational composition of their membership at individual level and their ability to 'harness' incentives and mandates operating in parallel outside the networks themselves. Mandated networks tended to have a more elaborate (because better-resourced) co-ordinating infrastructure. Network performance was achieved by producing artefacts for use in the hinterlands of the member organisations. These artefacts were predominantly intangibles (guidance, policies etc.) but some tangible service changes were also produced, especially by the user-controlled 'experience' network. In the CHD networks we found some evidence that the organisations which were more connected to the rest of the networks

also displayed larger reductions in the admissions avoidable through strong primary-secondary are co-ordination. These findings bring us to the explanatory (theoretical) implications of our empirical findings.

13 Discussion and conclusions

13.1 Summary of empirical findings

In summary, the empirical findings above suggest that in respect of the networks studied, the answers to our research questions are as follows.

1. *How do networks emerge as rational co-ordination structures? What determines the formation of both mandated and non-mandated networks?*

We observed two modes of network creation. Voluntary networks emerged 'from below' as groupings of individuals and organisations interested in performing common tasks, which might include producing relatively intangible artefacts such as information or guidance, or more tangible tasks such as changing service provision. Mandated networks were created 'from above' by (in this case) NHS management, typically by taking control of pre-existing emergent networks and then, in some cases, re-structuring them.

2. *In mandated networks, what prior social networks pre-exist and how do they affect the operation of the new, mandated network? Does re-organising network structure disrupt or enhance network processes, or not affect them at all? How does the inclusion of additional occupational groups and other network members (e.g. users) affect performance?*

As noted, mandated networks were typically created by NHS management taking control of pre-existing emergent networks. Often this involved merging existing networks. An effect of mandate was that network membership tended to include a higher proportion of managers, network objectives shifted, hence new activities were added. Re-organisation of networks themselves was not necessarily very disruptive but the restructuring of their member organisations, especially PCTs, did disrupt the NHS networks, sometimes severely and for a considerable period. Inclusion of users in the NHS networks did not have much effect on network activity but in the non-NHS experience network users played a decisive role because they controlled the network.

3. *What determines the way in which member organisations use relational co-ordination structures (or fail to)? What determines the effectiveness of member organisations' use of these structures?*

Members' engagement with networks depended upon whether participation in the network appeared to benefit the members, either in terms of meeting targets, mandates and incentives generated outside the network (for organisations) or in terms of their personal interests and opinions (for individuals). Member organisations used the networks partly by linking directly to each other. Brokership was not very evident. There was some evidence that the more highly-connected organisations showed a greater reduction in referrals susceptible to primary-secondary care co-ordination. But there was no evidence that network connectedness stimulated innovation-related activity. Neither was network connectedness associated with organisational climate.

4. *What types of co-ordination activities mediate the above effects?*

For co-ordination purposes the networks had a central steering group (or equivalent; different names were used) with specialist sub-groups for particular tasks. Although the network co-ordinating bodies were well-connected to most members in the study networks, they were not uniquely well-connected. To a large extent network co-ordination occurred through direct links between network members in pursuit of specific tasks. Co-ordination links between members were generally dense (most member organisations dealt directly with most of the other member organisations) and deep (on multiple levels). Network co-ordination was non-hierarchical. Activities involving the evidence-basing of clinical and care practice were an important means of co-ordination in the NHS networks.

5. *How do the different layers of network, dealing with different media or contents, co-exist and influence each other?*

The network layer(s) carrying out the core activity of the network tended to be the most dense. Network links mediated by money were never more dense than other layers of links, and usually much less dense. The structure of the financial incentives did not match other network structures.

6. How are member organisations within a network tied to organisations outside it, how are these relationships structured, and what effect do these relationships have on how effectively member organisations use relational co-ordinating structures?

Member organisations had relatively few and weak links to bodies outside the network. These external relationships therefore had little perceptible effect on how effectively the member organisations used the study networks. The member organisations' links to other

organisations within the networks were more numerous and stronger than their links outside the networks. Such links outside the networks as were present tended to be with inter-disciplinary bodies rather than with (uni-) professional networks.

7. What effects are produced by incentives to cooperate (or not to)? What match is there between incentives and network structures? That is, to what extent are links mediated by money homologous with links mediated in other ways? In NHS networks for example, how will the shifts to practice bed commissioning and payment by results affect network processes?

The main incentives to cooperate were the expectation of practical help-in-kind and the persuasive power (and legitimacy) of evidence-based practice. As noted, financial links and therefore incentives played only a small part within the networks. Network co-ordinators were however able to 'harness' more powerful targets and incentives originating outside the networks. These external incentives originated partly from payment by results. At the time of this study practice based commissioning had little effect on the study networks.

8. *What determines the performance of mandated and non-mandated network structures, and are there systematic differences in the performance of the two kinds?*

Voluntary and mandated networks differed in terms of some of their objectives and core activities (i.e. what the networks performed), reflecting the occupational mix of their memberships (see above); in their ability, created by the mandate, to 'harness' incentives external to the networks; and in having a more elaborate (because better-resourced) co-ordinating infrastructure. Network artefacts were predominantly intangibles (guidance, policies etc.) but some tangible service changes were also produced, especially by the user-controlled 'experience' network. In two of the largest networks we found (somewhat equivocal) evidence that the organisations which were more connected to the rest of the networks also displayed larger reductions in the admissions avoidable through strong primary-secondary are co-ordination.

To operationalise the research questions in greater detail we developed supplementary hypotheses. Table 34 summarises how these hypotheses withstood empirical testing in our study sites.

Table 34. Summary of empirical findings about the supplementary hypotheses

Hypothesis	Supported, qualified or refuted for study networks?
RQ1. Origins of networks	
H1A: Voluntary networks have occupationally more diverse membership	Qualified. Voluntary members tended to have more diverse clinical and carer membership, but mandated networks had greater managerial representation.
H1B: Networks emerge in pursuit of common policy goals	Supported.
H1C: Non-mandated networks are created as by-product of other, *de facto* relationships and organisational structures, as the (future) network members pursue shared economic interests using shared technology.	Supported. Non-mandated networks emerge in pursuit of common tasks.
H1D: Voluntary networks' processes are more likely to emerge to serve non-rational and irrational needs	Supported, but on evidence of a single case study of a small network.
H1E: Mandated networks are created by one or more of: 1. legal requirement for practice, hence collective agreement between profession and state; 2. 'closed shop' or cartel; or by managerial direction.	Qualified. Mandated networks in this study were created by managerial direction only.
RQ2. Mandated networks	
H2A: Mandated networks include involuntary members.	Refuted. Dissident individuals left mandated networks.
H2B: Mandated networks are 'enclaves' in the sense of having a formally defined and closed membership. Voluntary networks have	Supported.

fluid membership, mandated ones more stable membership.	
H2C: Mandated networks are (structurally) uniform (within the economic sector).	Refuted. Network membership varies by network function.
H2D: Prior voluntary networks persist within subsequently-mandated networks.	Supported. 'Sedimentation' of objectives and activities occurs.
H2E: Mandated networks are more comprehensively, systematically managed across the whole network than are voluntary networks.	Qualified. Mandatory networks had more resources for their co-ordination activity, but were not more densely linked.
RQ3. Participation in and use of networks	
H3A: Connectedness will correlate with innovation-related activity.	Refuted.
H3B: Organisations whose internal climate is more favourable to collaboration will have more (hence denser) network links.	Refuted.
H3C: Service user involvement in voluntary networks is more extensive but uneven than in mandated networks.	Supported.
RQ4. Co-ordination	
H4A: In mandated networks, the co-ordinating body will 1. have the highest brokerage score in the network and; 2. be topmost member of any hierarchical relationships present.	Refuted (in full).
H4B: Compared with voluntary networks, mandated networks are: 1. more 'hierarchical'	Qualified. Points (1) and (2) are refuted.Mandated networks were more centralised (points 3 and 4) but all the study networks generally had low centralisation.

2. lower density 3. prone to have flows from core to periphery 4. more consistent in separation (all members relate directly to the core, and to each other mainly via the core)	
H4C: Voluntary networks will have more relational, trust-based internal co-ordination and roles than mandated networks.	Qualified. Financial relationships were not dominant in any network but mandated networks 'harnessed' external incentives and mandates.
H4D: Voluntary networks have negotiated allocation of roles.	Supported.
H4E: Voluntary networks deal with conflicts by exit, mandated ones by negotiation and voice. Power distribution is more fluid and shifting in the voluntary network. In mandated networks, because exit is not possible oppositional activities occur, both passive (self-isolation, non-compliance) and active.	Refuted. Voluntary networks dealt with conflicts by negotiation, voice or peaceful co-existence, the mandated networks by exit.
H4F: Mandated networks show uniformity and formalisation of organisational processes and flows than voluntary networks do.	Refuted.
RQ5. Layering	
H5A: Network layers through which the core process of a network are delivered will be denser than the other layers.	Supported
RQ6. External Links	
H6A: [Alternative hypotheses] Individuals with greater local, regional and national links outside the study network will have 1. more extensive links within the network (because they obtain resources from outside the network to share within the network).	Refuted (both alternatives). There was neither positive nor negative correlation between internal and external linkage.

Alternative hypothesis: 2. fewer links within the network because non-network links substitute for the network.	
H6B: More strongly professionalised occupations (i.e. doctors) are more likely than other professions to have contacts outside the network.	Supported, but differences not great.
H6C: Each profession is more likely to have contacts outside the network with fellow-professionals than members of other professions.	Refuted.
H6D: Networks with more external links report higher level of innovation-related activity.	Refuted.
H6E: Providers with more external links will report better outcomes (in terms of admissions preventable by primary-secondary co-ordination).	Refuted
RQ7. Incentives	
See above, RQ4/H4C on co-ordination and RQ5 / H5A on network layers.	
RQ8. Performance	
H8A: Organisations with more extensive network links will have lower rates of growth of admissions for conditions where admissions are preventable by strong primary-secondary care collaboration.	Supported, but evidence somewhat equivocal.
H8B: Simpler networks with fewer interfaces are more likely to succeed (in the above terms) than complex ones.	Refuted

H8C: Outcomes should be best (in the above terms) when each member organisation relies on a few strong relations for most of care delivery whilst a few weak ties are maintained for information search.	Refuted.
H8D: Teaching hospitals will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.	Qualified. Valid (and in this study testable) only for 'long-established' teaching hospital(s).
H8E: Organisations an internal climate favourable to collaboration will report better outcomes in terms of admissions preventable by primary-secondary care co-ordination.	Supported
H8F: Organisations with high levels of innovation-related activity will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.	Refuted
H8G: Organisations which are more central to the network will report better outcomes in terms of admissions preventable by primary-secondary co-ordination.	Supported
H8H: Mandated networks show swift, relative uniform implementation of mandated policy but a narrower range of activity than non-mandated networks.	Qualified. The experience network produced some artefacts typical of the other kinds of network, except a project network, but the converse was not true.
H8I: Voluntary networks are more likely than mandated networks to produce symbolic artefacts and function as social networks (in addition to their stated practical goals)	Refuted.
H8J: Voluntary networks will show more flexibility and openness to innovation, especially innovations coming from grass-roots enthusiasts or introduced by boundary-spanners of structural holes.	Refuted.

13.2 Theoretical findings

13.2.1 Network origins, participation and mandate

Our longitudinal case studies suggest how, in light of the circumstances of a network's original formation (RQ1), the acquisition of additional members (RQ3) with a new mandate (RQ2) affects networks development and indeed the network's whole life cycle in a publicly managed health system. That life cycle has the following phases:

1. Emergence: Enthusiasts set up a voluntary network (see chapter 5)
2. Recognition: Public bodies 'validate' and resource the network (see chapters 5,11)
3. Capture: Public bodies try to mandate and manage the network (see chapters 5,6,10).
4. Contestation: Other governance structures start duplicating the network's functions (see chapter 11).
5. Abolition, possibly through official de-recognition and loss of membership, leaving either a residual network or none (chapters 1,2).

All networks experience the first stage but continuing to the second and later stages is not inevitable. Stage 3 can (and did in four of our study networks) involve a change in the network's function.

Of network emergence it has been claimed that in general individuals tend to network with others who are like them (homophily) (112-114); in particular, with those with whom they share common 'values' (103). Our findings about the foundational role of core processes in networks (see below) suggest that homophily of tasks is of greater importance than homophily of persons. To be sure, a common task might well imply homophily of persons and of 'values', except that different members can use the same task for different purposes (e.g. research into evidence-base of treatment for therapeutic use *versus* cost control *versus* research). Emergent collaboration did not require a coherent, explicit set of collective objectives or 'values'.

Explanations of network emergence in the market contexts were found not to be relevant to health networks, in terms either of who forms the network, the objectives (hence function) of the network, or its main activities (core processes). Analyses of how business alliances form or the New Institutional Economics accounts of network formation say that members form networks form to gain access to commercially valuable resources, technical know-how, marketing resources, economies of scale or vertical integration (90);

or to manage demand uncertainty, asset specificity, frequent transactions, risk and competition, for instance through flexible use of agencies, outsourcing and subcontracting (77,95-97,91-94). Our findings show that these scenarios are special cases that apply to specific settings (commercial firms in markets) and not to others; in particular, not to NHS-like health systems.

During the recognition phase, the network acquires more members and resources. It develops in size and complexity, but not in its goals. If core process is what holds a network together, that explains why new membership *per se* does not necessarily affect network function. The effect of network expansion depends, our findings suggest, upon whether the additional members have similar reasons for joining the network, and bring similar resources, to those of existing members. If they do, our experience network showed, this addition simply enlarged the existing network without qualitatively changing its core process. If they do not, either a sedimentation of new objectives and core processes onto the old ones occurs; or, if the new members are powerful enough (sufficiently numerous or well-resourced or authoritative) 'mission drift' occurs. We found that voluntary networks became involved in implementing central policy and guidance through either of two mechanisms. First, public-sector member organisations, especially NHS bodies, became obliged for reasons extraneous to the network to try to implement current policy imperatives, guidance and targets, then use the network to help them do so. Second, public bodies offered grants or practical support to the network, or to commission it, but on conditions which included help in implementing current policy.

The networks' objectives changed. The networks experienced capture. A radical change in objectives implies a change in core process, with a new core process either:

1. replacing the original one (as when four of our study networks evolved from referral to programme networks). Concomitantly the network's internal balance of power, co-ordination and governance regime change (116). Then, the effect of a mandate would indeed be 'distortion' (37) of the original function of a clinical or professional network.

2. supplementing the original one (as in the study site which began as project networks but acquired referral and programme network activities). The result is a dense, because sedimented, network with two or more concurrent functions. This sedimentation of core processes explains why networks at times involve collaboration on different levels: service provision, policy-making and so on (10).

Whether or not a network is captured, however, our findings confirm (208) that for networks to function effectively requires relative stability in their function, membership and co-ordinator.

Contestation of the network when other governance structures were created to implement the same policy mandates as the original network. In one of the study sites a parallel, overarching network co-existed with the study network. In another site, a larger network was created and the study network absorbed into it. Across all the study sites, though, quasi-market structures (payment by results; practice based commissioning; patient choice) were being set up during the study period. Many of our informants saw these quasi-market structures as doing similar co-ordination work to the professional and clinical networks, or even as doing that work instead of the study networks. Either way the core process of the network was duplicated and contested.

Abolition or collapse of networks was explicitly debated in Regional CHD Network during the study period, and actually occurred soon afterwards in Child Mental Health Network. In both cases the reason was that senior managers within the network co-ordinating body considered that the network's core activity (core process) had, or was about to, become redundant. However the persistence of the original task and its core process would cause the persistence of network 'rumps' and residual support networks even after the network co-ordinating body was officially de-recognised or abolished.

13.2.2 External links and openness

'Structural holes' are points where the links between network members, between sub-networks or indeed between whole networks, are few. The minority of network members who bridge these structural holes then act as a link or 'tie' transmitting new resources – in particular, knowledge and innovations – from one network (or sub-network) to another. These 'weak' external ties enable networks to generate and disseminate innovations. Such ties have been described in other empirical studies and attributed to networks generally (3,96).

Our study networks contrasted with this picture. A consequence of becoming a mandated network was that the NHS networks focused on bridging any structural hole between the network (and especially the network co-ordinating body) and policy makers rather than upon bridging structural holes to other external sources of innovation, knowledge or other resources (see RQ6). The NHS networks were embedded within an implementation structure rather than a wider 'community'. However, the experience network was also largely inward-looking, despite having no

mandate. In particular, three bridges over external structural holes were absent from the study networks:

1. *To users:* In six of the study networks user participation, though regarded as legitimate, was slight in scale or effect. These networks remained at the third or fourth of the eight rungs on Arnstein's 'ladder' of participation model. Users 'hear and are heard – but are not heeded' (209). These conditions tended to falsify the policy assumption (see chapter 1) that the addition of user-representatives would substantially increase user 'voice' (210,211) in the management or monitoring of NHS services. The stark contrast with the experience network suggests the explanation (theory) that two conditions were necessary for a high and influential involvement of users in health networks. It is necessary that users:

   (a) dominate the co-ordinating body and;

   (b) are technically integral to the network's core process.

   The second of these conditions is likely to produce the first because condition (b) would make it difficult, even impossible, for a network to function without the active involvement of those service users. The second condition, however, depends on the technical character of the core process. It is feasible to involve users in self-care but not (or at least, not actively) in, say, technically complex surgery.

2. *To uni-professional disciplinary networks.* Latour (212) and others (213) emphasise the persistence, not least in medicine, of personal, educational and social networks formed during the professional's training into her subsequent working relationships. In our study sites, professional solidarity appeared to operate through other means: either through social networks independently of clinical and professional networks (but our ethical approval did not permit the present study to collect such data about personal or informal social networking); or through organisations such as professional associations, including informal organisations within member organisations and not visible at whole-network level.

3. *To network hinterlands within member organisations.* In our study sites, network linkage was not associated with innovation-related activity (which is anyway not quite the same thing as innovation). Instead, we infer that the production and transmission of artefacts to key actors within their member organisations is a possible explanation of how networks contributed to producing the observed changes in admissions and the other observed service changes. Member organisations, and key actors within them, made use of these artefacts for three main reasons. One was the persuasive legitimacy of evidence-

basing practice, an activity which many of the network artefacts embodied. A second was that the networks provided help-in-kind (practical help) in satisfying motivations, targets and incentives that their members, both organisations and individuals, were already exposed to. Among the targets and incentives were (thirdly) parallel incentives that operated outside the networks themselves. This explanation of how networks produced their effects fits our data better than our original conjecture that networks helped to stimulate innovation-related activities within their member organisations. In contrast to the account of 'receptivity' to innovation proposed by Newton et al. (214) we therefore propose an account – which applies only to externally-generated innovation – of receptivity to innovation as requiring all of:

(a) linkage to sources of innovation outside the organisation in question. These links which convey into it artefacts which represent or embody an innovation; and

(b) an organisational climate favourable to the adoption and application of the artefacts (indeed of new working practices in general), reflecting relationships of trust between different occupational groups.

(c) Incentives for key actors within the receiving organisation to make use of the artefacts.

Conversely, earlier studies report that network closure (129) or very dense or homogeneous network structures (130) prevent external 'weak ties' being a source of innovations. We found both closure and dense ties in the study networks.

Mandate does not explain these conditions because a similar pattern was found in the two non-mandated networks. Neither does long duration of stable relationships between the member organisations because the experience network was newly-established at the start of the study period. A more likely explanation is that this form of network closure results when network members:

1. do not perceive any actual shortage of resources which external bodies could remedy (or, legitimately remedy). They regard their local health economy as closed and (collectively) self-sufficient.

2. do not perceive external resources as potentially exploitable. (For instance, they do not know how to exploit new service providers or sources of funding.)

3. implicitly regard the network as an implementation structure (69) for particular policy mandates rather than as a means for producing non-mandated innovations in service co-ordination.

However we did find networks acting as inventors in their own right, not only as innovators finding, transmitting and implementing inventions or discoveries made outside the network. How invention occurs within networks also requires further research.

13.2.3 Co-ordination and incentives

Internal co-ordination (see RQ4) of the study networks conformed in many ways to the widespread view of network governance as non-hierarchical, relatively egalitarian and democratic structures. That was most obvious in the increasing importance of knowledge management as a co-ordinating mechanism, the more heavily medicalised the networks were (see chapter 9) and in the networks reliance on help-in-kind and intrinsic motivators (see chapters 9, 11).

Like Sowa (10) we recognise that network links can vary in terms of the closeness of collaboration they represent. The present study takes this argument one step further by operationalisation that idea in terms of the 'depth' (multiplexity or multidimensionality) of links between pairs of network members.

In apparent contrast to some other networks (35,111), hierarchy-like structures in the sense defined by Krackhardt (161) were absent in the present study networks. So was brokerage. Both the network co-ordinating body and the other network member organisations were simultaneously subject to direct mandates from central bodies, instead of the other network members being indirectly mandated via the co-ordinating body ('network administrative organisation') as in some US networks (179,215,216). In those of our study networks which were mandated, the rewards and sanctions for collaboration, and against free-riding, operated outside the network. They were not mediated by the network co-ordinating body. Little trace was found of the 'soft coercion' reported in predominantly uni-professional networks in English primary care (110) . More generally, and unlike Walker et al (120), Pope and Lewis (121) and Huxham and Vangan (122), who identify the brokers within networks as key components of network effectiveness, we found little evidence of brokerage in the formal sense of the co-ordinating body or another subset of network members mediating between all the rest. Network members tended to deal directly with one another. The role of the co-ordinating body was co-ordination not brokerage. It promoted consistency of content in these multiple direct interactions: that network members all followed the same policies, used the same information or applied the same guidance (as the case might be).

Institutionalist theory lays great weight upon values as explaining how institutions generally, including networks, remain cohesive and able to carry out their collective activities. We found however that voluntary networks dealt with value conflicts not by resolving them but by peaceful co-existence rather than voice or exit. One in particular, Child Mental Health Network, functioned stably for many years even though there were value-differences between and within the participating occupational groups. What mattered to members of this network was the legitimacy of the (organisational or professional) source of other members' practical contributions to the network's work, not ideological or programmatic adherence to a particular set of values. In that large, long-established network, a unified set of values was clearly absent but it continued to function as a network because, each for their own different reasons and beliefs, its members all wished to contribute to its main process (making and co-ordinating client referrals). Contrary to one of our initial hypotheses, voluntary networks dealt with value-conflicts more by 'peaceful co-existence' than by 'voice' (i.e. debate) or by 'exit'. Conversely the presence of relatively unified value systems (supplied by policy mandate) was not sufficient to prevent long periods of quiescence in two other, large networks. A unified value-system was therefore neither necessary nor sufficient for a network to continue to function. Under the external impact of health system reform, artefact production changed first, followed by espoused values, and lastly (and least) by changes in the network members' underlying value-assumptions (202). We infer that the 'glue' in these networks was not shared 'values' but shared activity, that of producing network artefacts. This explains why, like other studies (143,145,146,217), ours found that knowledge management (technical persuasion) and authority based upon scientific knowledge embodied in guidelines and formalised clinical pathways was an important medium for network governance.

13.2.4 Layers and performance

Our findings tend to confirm the contrast (152) between network 'sociostructure' (what we have called 'core process') and 'cultural superstructure' (the co-ordinating body and its resources). Together these findings suggest that a network's core process is the explanatory key to understanding health networks of the kinds studied. Network members' perceived need for a given set of core activities (process) explained why networks formed, when and why the addition of new members affected them and why networks expired. It explained when and why external resources were used, and the conditions under which users played a central role. Also it explained what artefacts networks did (and did not) produce. The nature of the core process also explained which network layers were the most dense. The network's core process was in all but one case the most

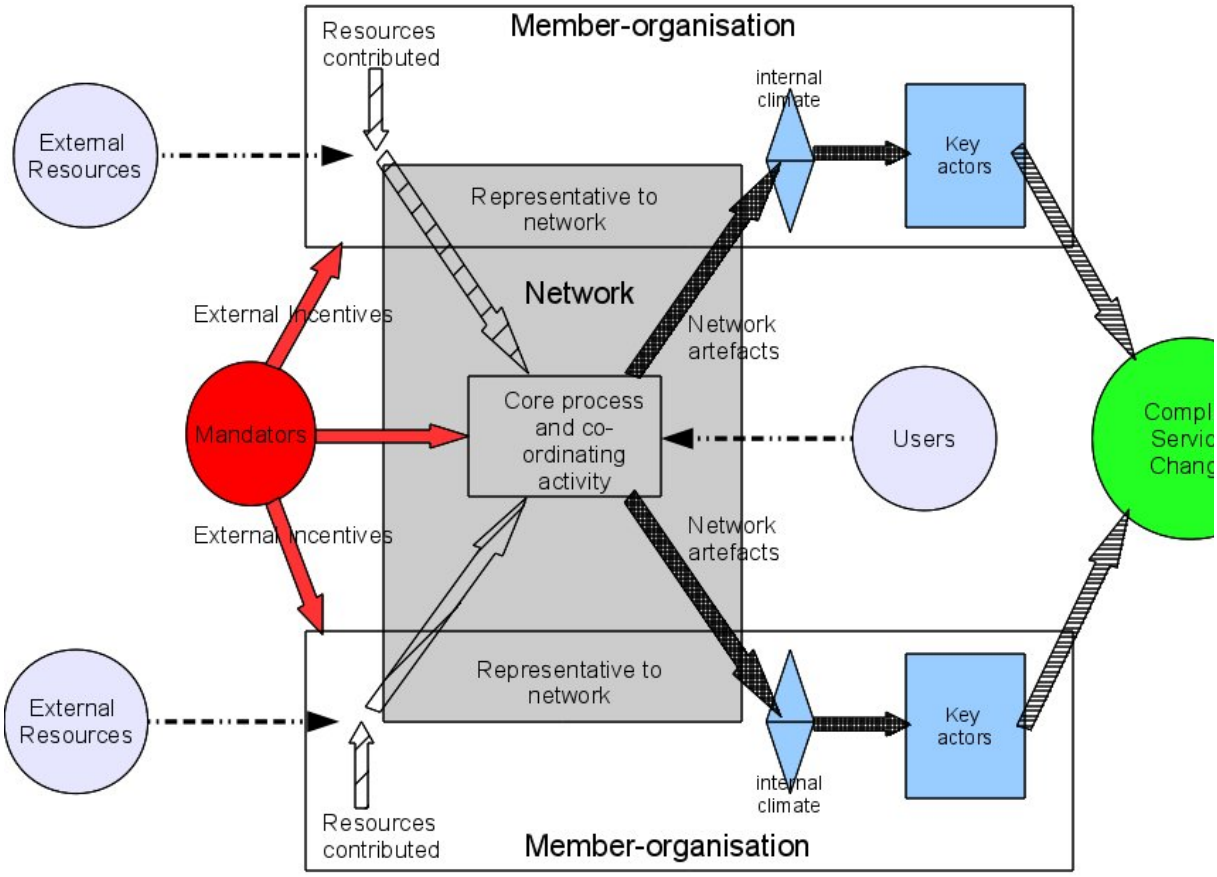
dense layer of links (RQ5). In the remaining network new functions had supplemented the original core process, replacing it as the network's *de facto* main function. Network effectiveness (RQ8) in changing services depended on how far the network's core process either extended into the hinterlands of its member organisations or (in the experience network) did not need to rely on those hinterlands.

Our comparison of networks suggests that for certain networks the core processes is impersonally determined and for others it is chosen. In the referral and experience networks, the scientific ('evidence') basis of the programmes which the programme networks sought to implement drew attention to the fact that in these networks (as in certain organisations) the core process is 'impersonally' patterned (109). It arises from and is constrained by the physical requirements of a process of production, independently of which individuals operate the processes and independently of individuals' or policy-makers' personal decisions. The activities required to prevent or treat CHD are biologically determined. At most, policy choices can be made about which of these natural processes to exploit. In contrast the necessary formulation of a service contract depends on regulatory, legal and policy decisions. But they are chosen by national policy makers rather than local health managers and so from the perspective of a programme network are also externally given. The more distant a health network's practical function is from the actual provision of care, the more its core process is determined by policy choices rather than impersonally.

13.2.5 How professional and clinical networks work: explanatory models

These theoretical findings can be combined into an integrated model of how professional and clinical networks work. Figure 3 presents a theoretical model to explain how mandated networks in health systems such as the NHS produce changes in complex services, that is in services whose delivery is distributed across multiple organisations.

Figure 3. Mandated professional and clinical networks: an explanatory model



For simplicity only two member organisations are shown but additional member organisations would be pictured in just the same way. The sequence by which a mandated network produces complex service changes begins with the inputs (on the left of the diagram) that member organisations bring to the network. Fundamental among these resources are the member organisations' own engagement in the network, for the network only originates because these organisations collaborate in pursuit of common goals (see RQ1). Via the 'boundary spanner' individuals who represent them in the network, the member organisations contribute resources (shown by the cross-hatched arrows in Figure 3) to the network.

Studies of non-mandated networks describe how, by virtue of their involvement in other, external networks, member organisations can also act as 'weak ties' for the introduction of further, external resources into a given network. Such ties were weak or absent in our study networks (see RQ6). Their nearly-empty places are shown by dotted lines in Figure 3. Similarly, the nearly-empty place for user inputs into the activity of mandated clinical

and professional networks (see RQ3) is also shown by dotted lines in that figure. In contrast, the external influence which central policy makers (the 'mandators') simultaneously have upon all the network members and upon the network itself via its co-ordinating body is very much present and shown by the shadowed lines in Figure 3. The effects of this influence are described in earlier chapters (see RQ2, RQ7). Attached to many of the mandates and targets are incentives and penalties directed at the network's member organisations to compel compliance.

The resources which the networks do obtain then enter the 'core process' by which the network members collaboratively transform these input resources into network artefacts. This core process involves distributing and redistributing these resources, as they are gradually transformed, among the network members. The links between network members, through which these transfers occur, lie within the 'black box' (for legibility shown as light grey) in the centre of Figure 3. The links themselves, their characteristics and structure are more fully described in the network maps in the appendices and the social network analyses of preceding chapters, as are the different 'layers' of links (see RQ5). The resources which are so distributed include but are not necessarily limited to: help-in-kind; patients (i.e. referrals); physical goods and services; administrative information; knowledge about how to organise and provide patient care (e.g. technical guidance, EBM, models of care); money; and such intangibles as authorisations, decisions, property rights and moral obligations to reciprocate past help in the future.

Network co-ordination (see RQ4) of the core process also takes place through these links, in particular the links between the network's co-ordinating body (if there is one) and the other network members.

The result is the production of network artefacts, tangible or intangible as the case may be (see RQ8). Our findings also suggest an important distinction between final outcomes and intermediate artefacts. Final outcomes more or less closely approximate to the network's objectives, such as cured or healthier patients, legislation, complex service changes, or the completed execution of a policy mandate. Intermediate artefacts are those intended to produce the final outcome, but are only means to that end. Staff re-training, building schemes or new budgetary systems might be examples. Similarly, networks produce both tangible and intangible artefacts. The former are such things as new services, re-trained staff, buildings, IT systems and the like. Intangible artefacts are such things as decisions, plans, and recommendations for clinical practice which only exist concretely in the form of documents.

Network member organisations so to speak 'take delivery' of these artefacts. As a 'boundary-spanner', each member organisation's

representative(s) to the network transmits these artefacts (or in the case of large physical artefacts such as new buildings, rights of access to them) back into their own organisation. Solid black arrows in Figure 3 represent this stage. How receptive other members of the receiving organisation are to these new, external artefacts depends upon that organisation's climate, as we have defined it. The more favourable the climate, the more likely that the artefacts will reach and be used by the 'key actors' in that organisation. These key actors are not necessarily (indeed, not usually) members of the network itself. They are the 'front-line' clinicians, care staff or other employees who, if anyone does (see RQ3), apply in everyday working practice the artefacts which the network has produced (grey arrows in Figure 3). 'If anyone does' is an important qualification. The extent to which key actors within member organisations make use of the network's artefacts reflects, *inter alia*, the strength of the incentives and motivations which led that organisation to participate in the network in the first place. It also reflects the extent to which these key actors depend (or not) upon the artefacts which the network provides. The performance of a network depends not so much on its size or complexity as upon key actors in the 'hinterlands' of its member organisations, outside the network's control. But if key actors in two or more member organisations do apply the network artefacts in practice, the network will have produced a complex service change.

Figure 3 shows how a network's core process extends outside the network itself into the hinterlands of its member organisations. Previous studies (62,218) note the importance of 'boundary-spanners' as links between network member organisations. Taking that argument one step further, our findings add that equally important for the implementation of network decisions are the relationships between boundary-spanner and hinterland inside each member organisation. Previous chapters (10,11,12) suggest that this influence depends upon networks' ability to:

1. 'harness' the incentives or motivations which are most salient to the key actors the hinterlands of its member organisations.
2. produce artefacts which assist the key actors in pursuing these incentive or motives.
3. produce artefacts of these kinds which are useful or necessary to the key actors, and not obtainable from within the member organisations' hinterlands.

With its higher proportion of individual members and lower proportion of member organisations, a simpler variant of the above model also applies to the independent, user-controlled experience network that we studied. The mandators' influence over the member organisations was weak and the

corresponding incentives absent. The mandators had no influence to speak of over the individual network members. The network members were also mostly (but not all) the users of the services which the network provided and co-ordinated.

Using similar symbols to the previous figure, Figure 4 shows the explanatory model for the user-controlled experience network. The model in Figure 4 is closer than the one in Figure 3 to the models of networks described in studies of networks in other health systems and in market settings, but is still distinct from them.

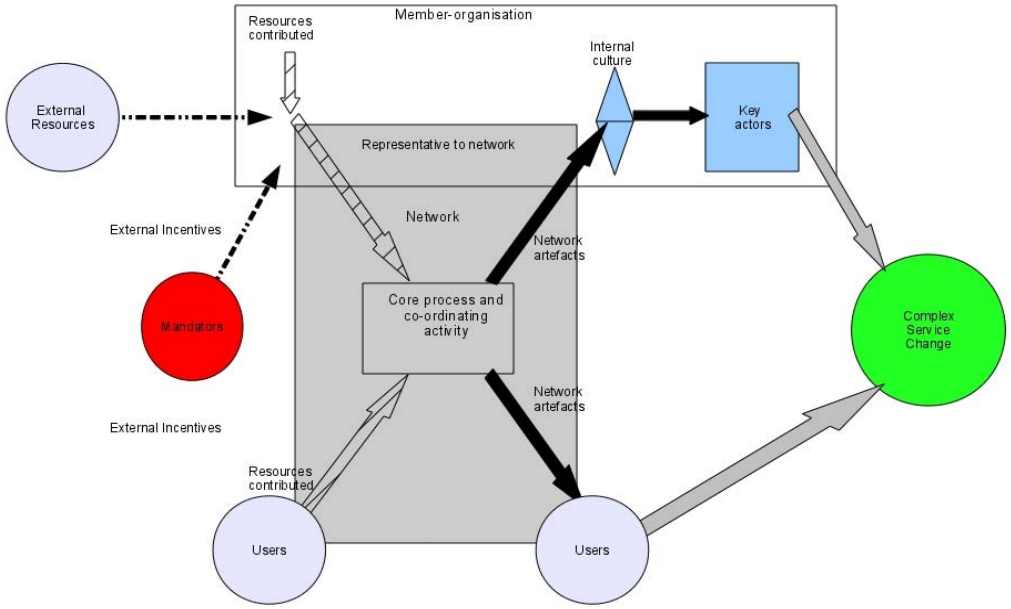


Figure 4. Voluntary user-controlled experience network: an explanatory model

The contrast between the Figures 3 and 4 suggests why the Self Care Network was comparatively successful in producing a range of artefacts and services for patients. Its members undertook the network's core process themselves. In contrast, Figure 3 shows the case where much of the network's core process lay outside the network itself, in the hinterlands of the member organisations. The more complex and indirect the links are between boundary-spanner (network representative) and key actors (clinical staff, contract negotiators, building contractors etc. as the case may be), the more fragile was this part of the network's core process, for the more it

lay beyond the network's direct influence. Our initial hypothesis (H8B) that simpler networks with fewer interfaces are more likely to succeed than complex ones was therefore on the wrong track. Rather, networks are more likely to succeed when the parts of their core process which lie within the member organisations' hinterlands are simpler in the sense of being more directly influenced by the boundary-spanning network representative; and most likely to succeed when the network directly operates its whole core process within the network itself.

The distinctive theoretical contribution of this study is thus to explain health networks as being, at their core, a process of production.

13.2.6 Implications for network theory

Mandated clinical and professional networks in health systems are a specific kinds of network. Certain governance mechanisms and the corresponding network structures which would have facilitated their operation, and have been reported in other networks, were conspicuous by their weakness or absence in our study networks. In particular, market-like financial incentives and links were absent. Unlike business alliances, professional and clinical networks in NHS-like health systems were not a sub-market or even a cartel within a wider market. Their origins, objectives and structures were correspondingly different. The 'special case' character of clinical and professional health care networks has implications for network analysis more generally. The structures of brokerage, bridges across structural holes (and structural holes themselves), centrality (of a co-ordinating body) and 'hierarchical' network structures are not empirically universal, still less defining, features of networks *per se*. The analytic value of these concepts is rather that they identify structural characteristics whose absence would define the character of one network just as much as their presence would define the character of another.

The taxonomy by which Southon et al. differentiate types of network (169) turned out to have face validity and to be readily usable for empirically analysing networks. Moreover it proved to be a way of differentiating networks in theoretical (explanatory) terms of core process. We can now develop and qualify the typology by observing that

1. It is not exhaustive. It ignores (say) policy networks even within the health sector, for instance the 'policy 'communities' of organisations which governments choose or are compelled by *force majeure* to consult (71) about health policy development. Networks outside the health sector have further functions again (e.g. as cartels or business alliances).

2. As other studies also describe (179,71,19,37,219,220), health networks can in practice serve more than one function and therefore fall into more than one of the Southon categories. Thus the typology of Southon at al. identifies conceptual ('ideal') types of health network function which can be combined in practice. Table 35 shows the functions of the study networks by the end of the study period, showing the main function of the network in black and the secondary functions in grey.

3. It implies a classification of network artefacts in terms of what uses (functions) the artefacts serve. Because of their different functions, each type of network typically produces different kinds of artefacts (table 36). As previously noted artefacts may serve symbolic besides practical purposes but table 36 focuses on the latter.

Table 35. Multiple functions of the study networks

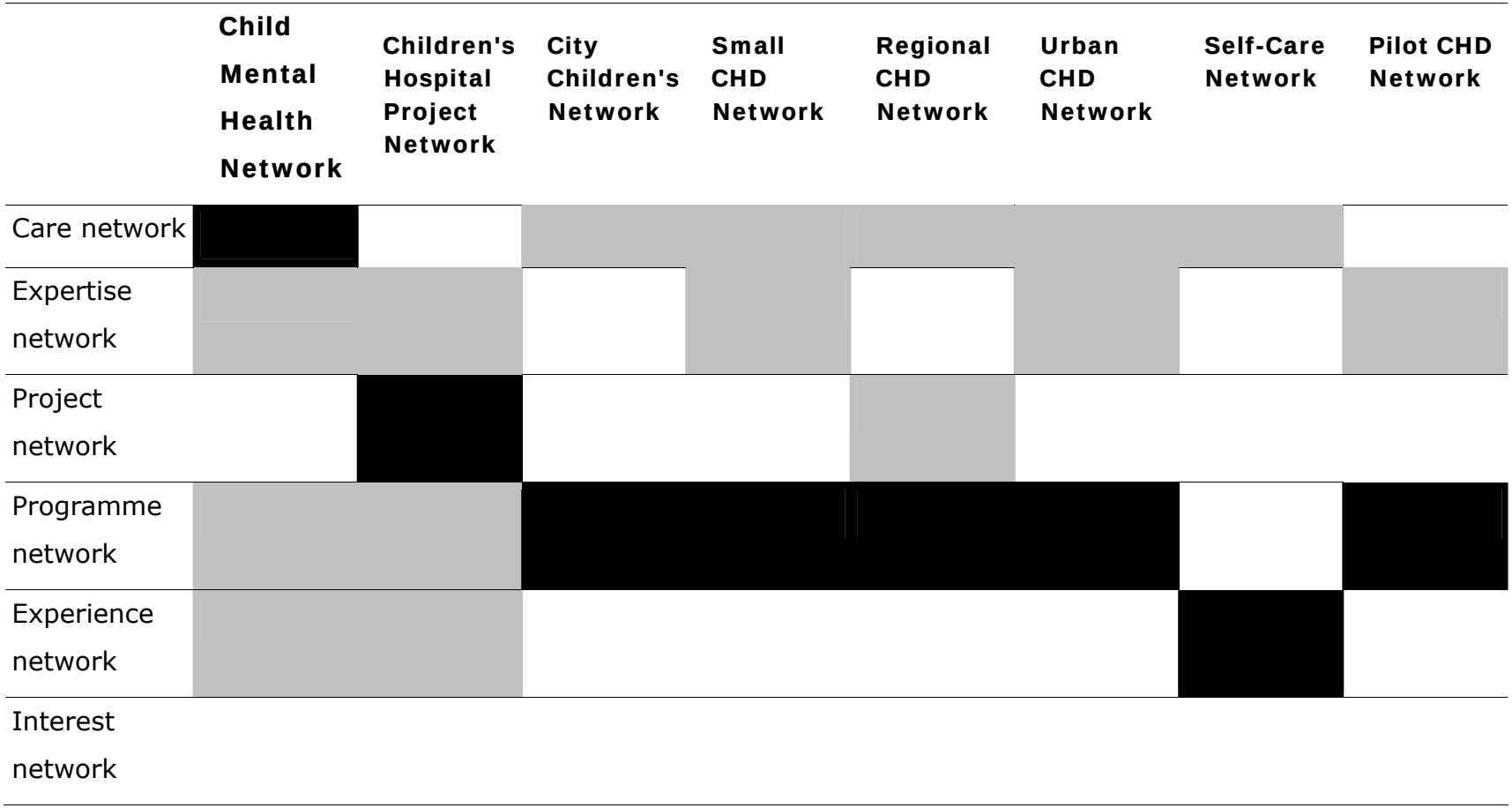


Table 36. Health network types, functions and artefacts

Network type	Function (type of goal)	Typical artefacts
Care network	Cross-organisational patient care	Referral routes; physical inputs to care; recruit and train care-giving staff; patient and carer recruitment; patient information exchange; clinical and social care knowledge-sharing; funding for services; information from providers to patients and carers; clinical audit against internally-generated norms; demand management; support groups (clinicians and/or patients) for specific diseases or services; recruitment of, or decision to exclude, providers; guidance on when, how, to access and use existing models of care or technologies.
Expertise network	Occupational control of work	Policy documents and other materials and activities promoting occupational group's interests to government, media, public; credentials for entry to profession; disciplinary structures to exclude deviant members from it; ethical codes; recruitment of professional members; materials and activities promoting solidarity within occupational group; lobbying or campaign activity; norms of professional practice; research, including critical 'benchmarking' scrutiny of practice.
Project network	Capital project, complex innovation or re-profiling of services.	Project design, timetables, division of labour; budgets; project planning and management systems and documentation; consultation, lobbying or campaign activity in support of the project; project planning and modelling; responses to sudden, large-scale health problems (e.g. SARS) or controversies.
Programme network	Implement pre-defined model(s) of care for a specific care group.	Rules of working practice; policy and managerial guidance; evidence-basing and translation into practice; data-bases, IT and research to monitor and evaluate compliance with programme; evaluation of existing working practice against programme norms; technical guidance and policy for new models of care or technologies; care pathway mapping and revision; formulation of interests of community representatives; provider contracts and other incentive systems.
Experience	Patient control over care	Resources or activities for patients and carers to use; mutual support and help; policy

network	and services	decisions; policy documents and other materials and activities promoting care group's interests to government, media, public; lobbying or campaign activity; funding for self-care; recruitment of members; personalised treatment options; therapeutic impact (e.g. in mental health).
Interest network	Official adoption of specific policies	Policy documents and other materials and activities promoting specific policies to government, media, public; supporting technical information; recruitment of new supporters; lobbying or campaign activity.

Some artefacts appear in more than one row in Table 36. Depending on the use to which they are put, two apparently similar artefacts – an evidence-based clinical guideline, say - might serve the function of referral management, a programmatic function (revision of care pathways), or the project function (e.g. specifying a completely new service). Similarly, experience, interest and professional networks all produce policy documents, campaigns and lobbying activities, but supporting different substantive policies and promoting different social interests. The *de facto* function of a clinical and professional network, and if its artefacts, has therefore to be inferred from how it is observed to operate in its health system context. We found one network (Children's Hospital Project Network) which had accumulated so many additional activities as to shift the balance of its activities away from its original mandate.

13.3 Qualifications to the findings

Certain qualifications and 'health warnings' attend the above findings and the theoretical conclusions drawn from them. We have to a certain extent relied upon self-reported data about network activities and outcomes. The risk that informants will tend towards self-justification makes this source second-best to observational data on behaviours (221). Collective memories of the origins of the networks tended to disappear with membership changes (which NHS re-organisations accelerated). Similarly, collecting data on patient experience retrospectively rather than prospectively (in 'real time') involves risk of recall errors (but the reasons usually adduced for preferring prospective to retrospective data collection in epidemiological studies are obviously irrelevant to the present study). Triangulation against other data sources reduces these limitations.

Our social network analyses abstracted from the directionality of links and was conducted only at the levels of links between member organisations not at the level of links between individuals except in the case of one user-experience network (Self-Care Network). We assumed that respondents simultaneously represent both their employing organisation and their occupation, but this assumption is empirically defensible. We treated certain non-responses in the data as indicating the absence of network linkages. Any resulting bias in the findings is therefore likely to be towards understating the connectedness of the study networks. Because we symmetrised some network data, our analysis for the (Krackhardt) hierarchical properties of networks could not test for the presence of unidirectional links but our findings from the other elements of Krackhardt's tests were already conclusive without this element. By using a simplified 'short form' data collection instrument the resulting binary matrices showed

the presence or absence, but not the strength, of links in each layer of each network.

Responses to questions about links to organisations or networks outside the study network sometimes elicited a simple 'yes' response without further details. In these cases we assumed the respondent had just one such external link, so our findings may tend to understate the number of external links. Our findings on referrals are not standardised for age-sex profile, nor for case-mix (severity) except where we have taken the analysis down to individual ICD level. The above SNA analyses may also tend to under-report the relationships that existed. Lack of association (correlations) may reflect low numbers of respondents with correspondingly low power to detect correlations or associations. On the other hand, the associations or correlations which were found were strong enough to be detected even under these conditions.

As to empirical limitations, the study sites included no policy, interest or professional networks. Our sample included only one instance of a project network and of a user-experience network, and so we could not include comparative data about the way in which other instances of those kind of network might instead form. Eastern England is not represented among our study sites, but there is no *a priori* reason to suppose that networks there would function much differently to others purely on account of their location. Our study includes a mandated network created by merging and mandating existing networks, but no example of a mandated network created *ex nihilo*. It was beyond the scope of this study to demonstrate what health outcomes the observed changes to artefacts and referrals produced or to conduct a cost-benefit analysis.

Generalisation from the study networks to others requires caution in view of the small numbers of study networks. Routine service outcome data could be matched to SNA data only for three networks. Comparisons of children's' networks are limited by different age-cut-offs (5 years *versus* 18) and breadth of care group (mental health problems only *versus* all health problems). Nevertheless our study networks do appear qualitatively fairly typical of their kinds. For example. the deputy co-ordinator of one of our CHD study sites (Small CHD Network) was also active at national level in CHD work and said 'I know that the experience of the [Small CHD Network] improvement is not unusual in terms of the country' (deputy co-ordinator, Small CHD Network). There is circumstantial evidence that other networks similar to our user-experience one may exist. A survey of physical exercise schemes for people with mental health problems in seven of the 40 English counties (222) found 102 projects, although without differentiating those based on a single organisation from those which were networks.

Our findings may not generalise so fully to cancer networks (37):

At the moment [2007], the managed function of these cancer networks represents a novel and distinctive structure that is not present to the same degree in networks in other clinical areas.

(p.96)

By omitting cancer networks which, having been the first NHS programme networks are likely to be more fully elaborated and have longer-established relational links, and therefore be more effective than our study networks the present findings may err towards understating the effectiveness of NHS clinical and professional networks under favourable conditions.

13.4 Further research needs

Notwithstanding these 'health warnings', the present study makes a number of additions to knowledge. So far as we are aware, it is the first attempt to trace how the positional characteristics of the member organisations within health care networks might impact upon the types of referral patterns which those networks might reasonably be expected to influence. The present study is not unique in making cross-network comparisons based on social network analyses, but such studies remain scarce, especially for health networks.

Our evidence for an apparent correlation between connectedness and referral changes (chapter 12) raises the questions and consequent suggestions for the further research:

1. Would the correlation be confirmed in studies of larger networks with more member organisations? A possible setting for such a study would be the emerging GP commissioning consortia, although the present study has also highlighted the difficulty of collecting sufficient data to make social network analyses in general practice settings.
2. Is that correlation evidence of causality, or is network connectedness a marker for some other characteristic (e.g. the internal managerial practices) of member organisations that really was the cause of the fall in preventable referrals?
3. If network connectivity did reduce the volume of referrals avoidable by good primary-secondary care co-ordination, through what mechanisms did this occur if not through innovation-related activity (as we defined it)?
4. We found that in one network but not the others, network connectedness was correlated with innovation-related activity. Although we speculated as to why Urban CHD Network was distinctive in this respect, further research would be warranted to explain this finding or, more generally, the mechanisms through which

connectedness within and between health networks stimulates innovation.

5. We revised hypothesis H8B to state that networks are more likely to succeed when the parts of their core process which lie within the member organisations' hinterlands are simpler in the sense of being more directly influenced by the boundary-spanning network representative. This revised hypothesis now needs testing.

Our finding that many NHS managers regarded quasi-markets as a partial (and in the view of some, a complete) substitute for networks calls attention to the lack of studies which empirically compare the advantages and disadvantages of networked, hierarchical and contractual, management for similar groups of services (above all primary and social care, though not only them). Commissioning bodies appear, our findings suggest, to need to apply different approaches in commissioning networks of users and voluntary organisations than they would apply in commissioning public, commercial or social enterprises. This area is also in need of research. Neither did the present methods allow us to test whether hospitals with stronger links to the network co-ordinating body in particular (as opposed to stronger links to the network as a whole) perform better in terms of reducing admissions preventable by primary-secondary co-ordination. Further empirical research would be required to test that conjecture.

None of the study networks used a management infrastructure 'bought in' from the private sector, in contrast to the FESC scheme and the recent white paper's suggestions. What effect this has on a network remains unresearched. For the English NHS, a larger research question is how the characteristics of GP commissioning consortia, as networks, compare with those of existing professional and clinical networks. Such a study would help define how far findings from the present generation of health network studies, and indeed from network studies outside the health sector, could also be applied to GP commissioning consortia.

This study also made three methodological inventions. We compensated for the lack of data on the strength of networks links within each layer of each network by measuring the strength of links in terms of the multiplexity or multi-dimensionality of relationship between pairs of network nodes; that is, in terms of what we have called the 'depth' of linkage. This between-layer measure of strength of links is a new contribution. We also devised (so far as we are aware for the first time) and applied an index of uni-professional versus multi-professional linkage. As an intermediate output of networks, we have developed and applied the idea of the network 'artefact'. This concept is applicable to network studies in general. As a methodological discovery, our findings also reveal a limitation to the uses of social network analysis in health care. For mandated networks, the mandators are not

network members but, rather are 'off-stage' outside network as dominant but so to speak absent or virtual 'members'; and invisible to social network analyses which are limited to the network itself. We also discovered the absence of a most important research tool. Although we could compare mandated with voluntary networks in terms of activities and artefacts, we could not compare them in terms of outcomes because no commensurable outcome indicators exist. To create and test them would require further primary research.

Ethical approval for the project excluded questions about friendship and social links. We explored the idea of collecting from the relevant file-servers anonymised data on volumes of e-mail traffic between network members. Technically this method is feasible but the tasks of gaining ethical and research governance approvals, and then informed consents for some 340 individuals, made it an unrealistic prospect within the time and resources available. Both these aspects of network structure and operation in health care await further research, as does the comparative cost-benefit analysis of such networks.

13.5 Policy and managerial implications

Three main sets of policy and managerial implications follow from the above findings.

13.5.1 Effective management of networks

A set of implications and recommendations follow, firstly, for the management of existing professional and clinical networks such as those described above. From the above findings we infer that:

1. The culture and quality of relationality in networks influences whether and how potential network members participate. Network identity does not emerge automatically. Network managers have to nurture and develop it, and make it explicit. A particular role of the network co-ordinator is to identify and involve the less-connected members, so as to increase the connectedness and therefore effectiveness of the network. This implies that network management requires specific skills and approaches, those of relationship-maintenance, diplomacy, consultation and negotiation. Networks should be managed in the same ways as other kinds of implementation structures, not as quasi-markets or as quasi-hierarchies.

2. We found that networks can function effectively without all their links and activity being mediated and directed by the co-ordinating body. For the reasons stated below, networks do need a co-ordinating body but not necessarily as a broker or mediator. For many core

processes (e.g. those of a referral or a self-care experience network) it is no less important to establish and conserve direct links between network members. For the network's core process is constructed of such links.

3. When networks cannot directly produce their intended objectives but rely on key actors in the 'hinterlands' of their member organisations, it is necessary that the member organisations select as their representatives to networks 'boundary-spanners' with sufficiently high status, power and authority within their 'home' organisation to champion and implement network decisions.

4. The task of engaging potential members (including influential boundary-spanners) becomes easier if the network can 'harness' the existing incentives which these members already face; that is, by ensuring that the network's core processes also contribute to realising goals which are also strategic and salient to the network members' interests and professional motivations. Another argument for negotiative styles of network management is that such approaches are likely to aid the network co-ordinators in understanding what external incentives her network might harness.

5. Comparing the user-controlled networks with the NHS networks suggested that user influence requires a strong user presence on the network board (or equivalent). But when users are marginal to the core processes of the network, greater user involvement will increase the network's managerial 'overhead'. In such networks there may be a trade-off to be made between practical effectiveness and user participation.

6. Mandated enclave networks are liable to become closed to outside resources. An important role of the network co-ordinator is to encourage network members, and the network collectively, to develop and exploit external linkages.

7. Knowledge-management (in health care, evidence-basing) of the network's core process is the most important medium of network co-ordination. The more medicalised a health network's activity is, the more important is knowledge-management as a medium of co-ordination.

8. Stability in networks' member organisations and their personnel is required for links, trust, and network culture to be nurtured and sustained. Frequent health system re-structuring is detrimental to networks, but seemingly a fact of life in the English NHS. Indeed Equity and Excellence raises the possibility of further disruption to existing professional and clinical network as public health responsibilities are

transferred to local government. Maintaining stable network membership and roles gives networks the best prospects of withstanding such changes.

9. On the basis of the above explanatory models, a general strategy for network monitoring is to monitor not only the network's policy outcomes, but as intermediate outputs its knowledge-management; what artefacts are produced and who they are distributed to; how far into the hinterlands of the member organisations the use of these artefacts penetrates; and what use is made of them there and for what purposes.

10. As we discovered when they were absent, network co-ordination requires certain basic, generic managerial tools. They include formulation of common and agreed network objectives and a clear articulation of the criteria of membership, a reliable system for keeping membership lists up to date, and strategies in place to reduce the damage when a network co-ordinator changes post. Networks need to be alert to changes in key network actors and establish an early warning system of membership changes. Obvious, even mundane, as this recommendation may seem, it is not always followed in network practice. The role of the co-ordinator or network manager is critical in sustaining health networks.

13.5.2 Role of networks in the health system

Secondly, some important implications and recommendations for the role of networks in a health system such as the NHS appear to emerge. In our view they are:

1. The NHS networks were productive of artefacts useful to their members and member organisations and, in a few cases, with direct impacts on patient care. There is some evidence they helped reduce referrals to secondary care. They promoted evidence-based practice. The NHS networks served several practical functions simultaneously and the self-care network compensated for weaknesses in NHS health promotion for an important care group. The networks thus made a positive contribution to the health system.

2. It has been known since the 1950s that even middle-sized commercial organisations require a planning function. The co-ordinating activity of the larger NHS programme and project networks appeared to fulfil service development and planning functions which, in past years, planners at Health Authority and Regional levels fulfilled. It has also been known almost equally long that a purely juridical interpretation and enforcement of commercial contracts is impractical,

even counter-productive. 'Relational' contracting is also required (223). The NHS networks also provided the 'relational' counterpart to complement contractual relationships in the NHS quasi-market. These are less obvious, but in our view still worthwhile, contributions to the health system.

3. Voluntary referral networks and self-care networks can function also as service providers. In a quasi-market it may appear that the obvious way of funding such networks is to commission them as one might a public or commercial organisation. We found (see chapter 11) that in the case of the small self-care network especially, this approach promoted a bureaucratisation of network and a diminution of what originally made it so valuable as a provider; its flexibility and responsiveness to the users who controlled it. In our view, a way to avoid this 'denaturing' effect would be to fund small voluntary provider networks through grants rather than contracts. If nevertheless contracts are used, we suggest that the commissioners need both to help and to trust the users who co-ordinate such networks, exercising a 'light touch', assisting and providing information or resources but leaving decision-making and the bulk of organising work to the users and their organisations.

13.5.3 Future networks: GP commissioning consortia

As chapter 1 explained, Equity and Excellence proposes a major extension of the role of new networks in the NHS. Our findings also appear to have implications for the development and management of GP commissioning consortia. These implications should be taken with caution because so many details of the consortia have yet to be finalised at the time of writing. However it does appear that GP commissioning consortia will be mandated, enclave (closed-membership) networks. They will have a dual function of commissioning secondary and co-ordinating complex primary care. Then, in our opinion:

1. Because network co-ordination depends heavily on relationality (which takes time and continuity to develop), and because shared activity is what networks emerge from and what gives them cohesion, it would be prudent wherever possible to set up the consortia as developments of existing PCB consortia and other existing local networks among GPs.

2. Because the GP commissioning consortia will serve the function both of a programme and of a referral network, they will face the prospect of co-ordinating two core processes (not just one). To us, this suggests the need for the network's (consortium's) co-ordinating body to have a correspondingly bipartite internal managerial structure and

resources. The skills required for managing existing health networks (see above) would also appear to be required for managing GP commissioning consortia.

3. Our findings about existing mandated networks suggest that unless steps to the contrary be taken, the GP commissioning consortia may be liable to become somewhat:

(a) closed to outside resources of knowledge, information and other 'real-side' inputs to their activities. As with existing NHS networks, it might be argued that one function of the network co-ordinators is to anticipate and reverse this potential tendency.

(b) impervious to patient and carer voice and influence. If that is in the nature of networks where patients and carers do not play a large part in the network's core process, it may be necessary to rely on other institutions or structures to give patients and carers a strong voice in the new commissioning systems.

(c) Sedimented with a gradual accumulation of mandates and activities, leading over time to the risk of 'mission drift'.

4. It is obvious that the effectiveness of the GP consortia as commissioners will depend on their ability to influence key actors (consultants, ward managers etc.) in the 'hinterlands' of secondary care providers. Less obvious, but an implication of the explanatory model we developed and tested above, is that their effectiveness will also depend on their ability to influence the 'hinterlands' of their member general-practices. That is not necessarily an easier task, and one likely in turn to necessitate the review of managerial work and structures within general practices.

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Appendix 1 Case vignettes with SNA maps

This appendix contains a narrative case vignette for all the study sites, each with a summary social network map for the five sites where sufficient data were available. The map shows the presence of links (in any layer). The network nodes (member organisations) have pseudonyms constructed on using the following system:

1. First initial is study site;
2. Second group of characters shows the organisation;
3. Third group (where used) shows department within that organisation.

Case A: Child Mental Health Network

This care network co-ordinated services covering the period from conception until a child's time of entry to full-time education (i.e. up to the child's 6th birthday). It emerged from long-standing informal cooperation between the relevant service providers in a small provincial city, which informal collaboration led to a conference for sharing knowledge and guidance. This led to the foundation of a managed network whose role became the development of care pathways for infants with mental health problems. An NHS manager who became the Director of the Child and Adolescent Mental Health Services (CAMHS) set up a Child Mental Health Network steering group of interested organisations in the city. At this stage, the group was provider run and led. Its membership came to include the commissioner (PCT) for children's and maternity services for the city, the city council (and its services), NHS and third sector providers, and the city council's Children's Service. The city council was for many years low-ranking in the local government league tables.

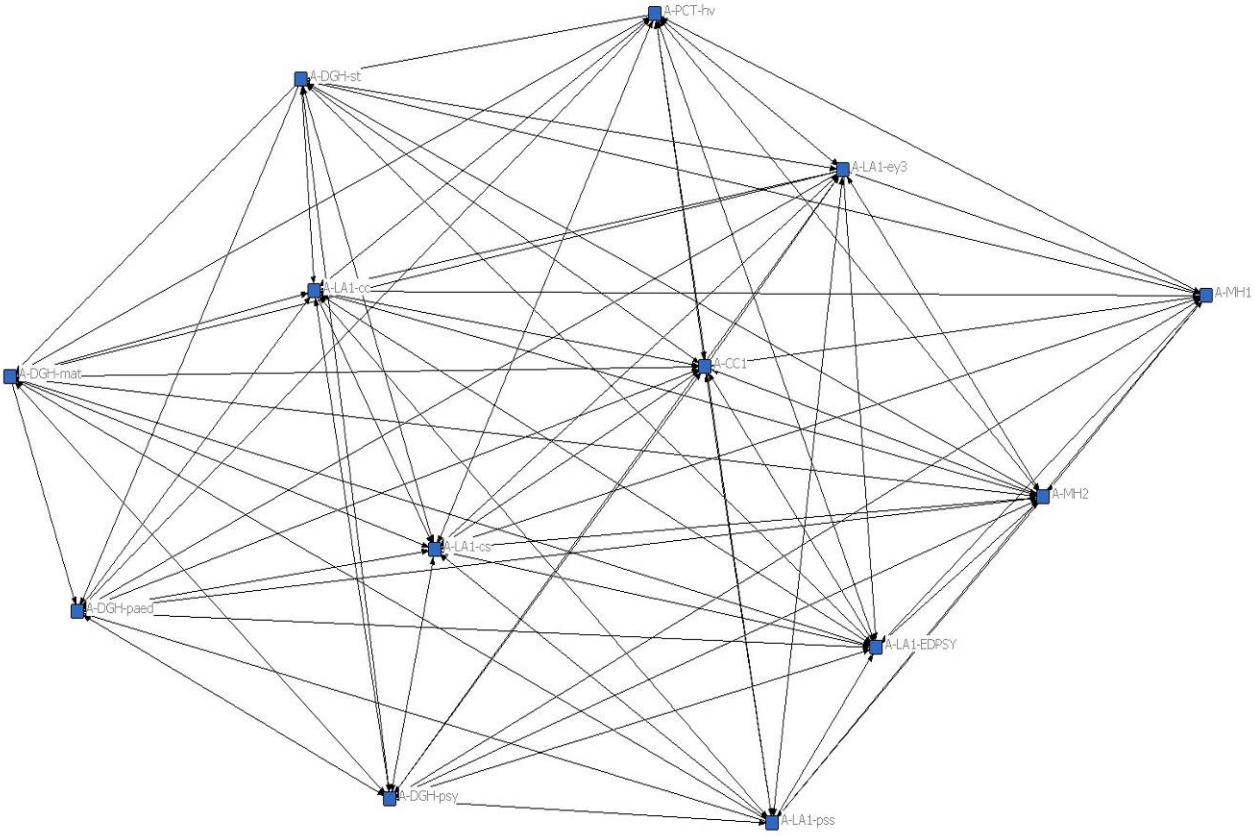
There were two main types of service providers in the network. The first are the services in the city (a number of Children's Centres, CAMHS) whose core activity was to meet the care needs of young children with mental health problems or mental health related problems (above all those of their parents, including alcohol or drug misuse). These services, in particular a new children's centre which the network established, mainly provided early and short-term interventions. Specialist CAMHS provided longer term treatment, though not necessarily as intense as those provided by the new children's centre. Most young children with mental health problems were seen by one or both of these services. The other group of services were services whose core activity was *not* infant mental health and had many other responsibilities beyond mental health. These included health visiting,

midwifery and speech and language services. Their responsibilities for child mental health were for prevention, identification and referral.

Under the lead NHS manager's direction Child Mental Health Network commissioned the local university to describe the nature of services to infants with mental health in the city and to identify any need and potential for service re-design. The university reported in late 2007. They found, *inter alia*, that the network of infant mental health services in the city had evolved piecemeal over many yeas and specialist services especially were fragmented and complex. Network members did not understand the network's structure and had divergent views about the purpose of, and practice in, mental health services. Subsequently the network's activity has focussed on designing an infant mental health care pathway with various members of the group given the tasks of designing its components. This task was still under way at the conclusion of the study, with a care pathway almost designed and ready to be implemented.

In March 2008 the network agreed that the chair would be transferred to a representative of the PCT as commissioner and the lead NHS manager formally handed over this role at the May meeting. Agreement was also reached that the focus of the group would be to influence the commissioning process, rather than simply act as a forum for interested (and mainly provider) organisations. This focus was to include the aim of co-ordinating services, helping the commissioning process to avoid gaps in provision and helping organisations to share information about policy, best practice and care pathways. Membership of the re-incarnated network was largely a continuation of its existing membership. Somewhat divergent views about the role of the group emerged. The chair and PCT representative's position seemed to be that once the group has designed and implemented the pathway, its work should cease. Others thought that it should continue with, for example, the role of monitoring the implementation of the care pathway. In 2009 the network was wound up.

Figure 5. Network map: Child Mental Health Network



Case B: Children's Hospital Project Network

The Children's Hospital Project Network was in a large city, where it undertook the project of re-profiling children's hospital services, including services for children with long-term complex conditions. In the early 1980s the (then) District and (then) Regional Health Authorities decided to rationalise children's services, then dispersed over a number of sites including old, small and unsuitable hospital settings; and to concentrate future service developments on a few well-developed sites, adapting primary, community and social care to permit these changes. The consequence of closing two children's hospitals was hotly and publicly debated in the city and several times re-negotiated between the NHS organisations involved. For these reasons, and because the local media from time to time headlined various proposals, the project became politicised. Eventually (1997) the Secretary of State intervened to break the deadlock

by mandating the broad objectives of the project, a time-scale for achieving them, and a project network structure for doing so. Hospital sites providing children's services were to be reduced from twelve sites to eight, the latter including a new children's hospital for tertiary services near the city centre. His decision mandated not only the network but also all its member organisations severally. Even so, consultations about re-profiling had to resume when PCTs were restructured in 2006, and then three local authority Overview and Scrutiny Committees still objected until an independent review overruled them.

When the time came to write the business case for the new children's hospital building, a Network Supervisory Board was established. *ad hoc* working parties and committees were formed into a project network formally charged with implementing this re-profiling project. The network's objectives applied to all specialities relevant to children including children with complex long-term conditions such as mental health problems, emphasising both the consolidation of children's services and the intention to treat children at home or as close to home as possible.

The network membership was formal representatives of member organisations, which included children's service commissioners, predominantly from the NHS (seven PCTs and the SHA) but also including some of the local government bodies in the city (which did not then have a unitary local authority). Of service providers, NHS organisations were again predominant, in particular the hospitals (both secondary and tertiary) but also PCTs in their capacity as community health services providers. The representatives of these organisations were senior figures; they included PCT chief executives, hospital medical directors (mainly paediatricians) and local government representatives. In 2003 its remit widened and so the network acquired sub-groups for paediatrics, CAHMS, obstetrics and neonates. The sub-groups' membership was predominantly clinical.

Also the network had a 'very vocal' public partnership board (PPB) and in 2006 the network began an extensive public consultation with the assistance of an external consultancy. This generated still further options for service re-configuration.

A most important output from the network was a document explaining how the extremely complex service changes that children's services would occur, and how the transition from the old to the new profile of services would be made. The strategy necessitated required quite detailed mapping of patient flows and demand modelling for the service changes which would follow the reconstruction or relocation of hospitals. The plans required constant updating and necessitated re-budgeting of the new services; and planning for their human resource implications (e.g. redeployment of large numbers of staff made redundant from closing services into the new ones).

Whilst the objectives of consolidating children's services were gradually being achieved, although it was too early to know what the impact on service quality and safety would eventually be. However the network regarded its main achievement as having broken out of the years of stasis and deadlock about how children's services in the city should be reconfigured, and progressed to actually re-modelling the services.

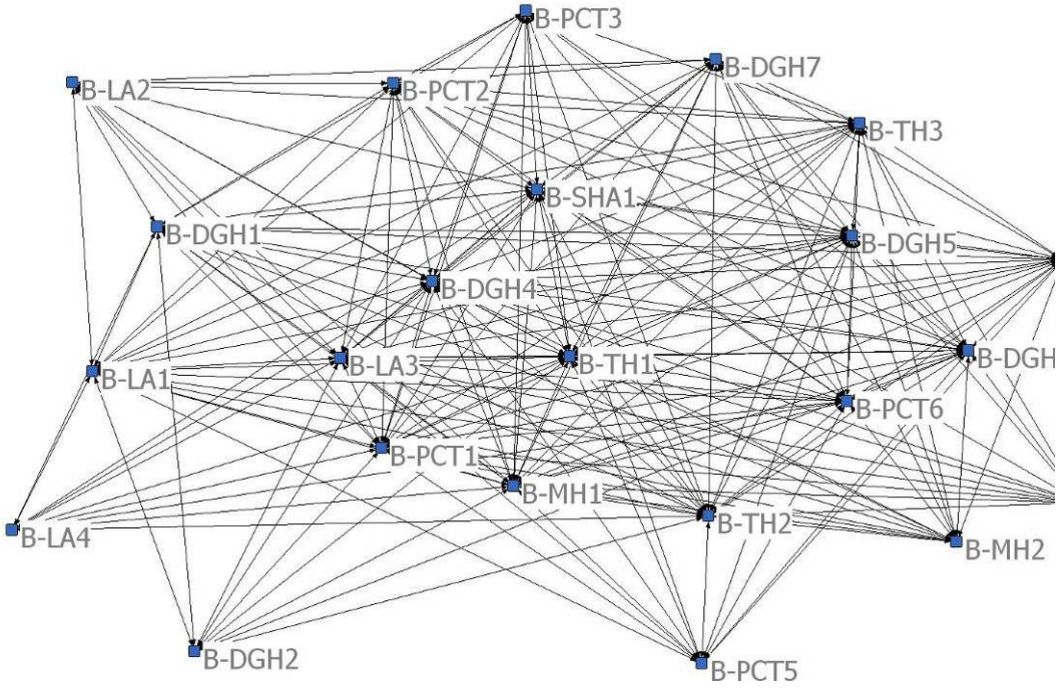


Figure 6. Network map: Children's Hospital Project Network

Case C: City Children's Network

City Children's Network has complicated origins, beginning with the local PCTs and then transforming itself into a Sure Start programme. Earlier studies there had given the researchers a background knowledge of the network's organisational character and development, in particular its links with social services and education, besides facilitating access.

The Children's and Young Persons (CYP) Trust network was the largest and most complex of the cases studied in the project. It is both a network and a strategic partnership and we joined it at its inception and nascent design stage. The governance structure was being articulated throughout the study period. It is a highly mandated network – more so than the other cases in that there is a duty for the constituent agencies to co-operate under the

Children's Act 2004 and to do within the philosophical and strategic ethos of Every Child Matters and the Children's National Service Framework. The case is located in a large conurbation of over a million people where 285,000 are under 19 with significant socio-economic and cultural diversity.

As in other study sites, previous professional relationships and networks existed, in particular the city had developed a geographical network of Children's Resource Centres, which themselves had grown out of Sure Start initiatives. This meant that there was some bottom-up network knowledge which was mobilised at the time of the establishment of the Trust and that the voluntary sector had a clear and accepted presence. The conurbation has a long history of civic provision of public services and contrasting political parties within its local authority. The local authority had a well established cabinet system with lead members and a specific lead member for children's services. The Partnership/Trust is structured in terms of an Executive Board whose partners were drawn from the following organisations:

- Children's Safeguarding Board
- Strategic Health Authority
- Primary Care Trusts
- Hospital Trusts
- Learning and Skills Council
- Probation Service
- Police

Board members each had dual accountability to the network partnership and to their respective host organisations. The network had to balance, comprehend, integrate and be fully up-to-date with over twenty-five pieces of guidance, legislation and advisory statements at any one time. It articulated the complexity in an overarching Children's Strategy Document, and then localised this strategy through a 'Futures' document. It then further articulated these strategic statements into a service issues matrix which explicated outcomes and performance levels by locality and neighbourhood. In this way the network linked its local priorities with national priorities. Conceptually, the organisational arrangements for the Trust are at once a matrix (partners and spatial axis); centralised (in regard to reporting and performance levels), and networked (distributed but integrated involvement). The strategic objectives of the partnership were articulated as a vision to:

- Use research and evidence about prevention and early intervention and the provision of specialist interventions.

- Be needs driven, and ensure that children, young people and their families are engaged in service development.
- Make sure that the workforce has the necessary training, skills and information.
- Help more people to value children and young people.
- Integrate the services where appropriate.
- Protect children from harm and make them feel safe.
- Support parents to bring up their children, go to work or contribute to communities.

These were further synthesised into six priority areas which mirror the five national Every Child Matters outcomes:

- physical health;
- behaviour;
- emotional health;
- literacy and numeracy;
- social literacy (the ability to get along with people); and
- job skills.

At locality or neighbourhood level, these were then converted into performance indicators (PIs) with specified targets for achievements in, for example, a reduction in childhood obesity, domestic violence and bullying. Each area of achievement had lead partners identified with it. The Trust made full use of a 'logic model' approach which is designed around outcomes. In order to achieve these outcomes, activities, policies, services, programmes were specified at a very detailed level as is the subsequent sharing of decisions about investment and performance measurement that impact upon such activities.

The activities in the Trust were characterised by a great deal of attention to the planning mechanisms and understandably to the governance design. This was designed in terms of a functional analysis which encompassed:

- Strategic directions;
- Availability of effective interventions;
- Tracking progress against interventions;
- Commissioning;
- Integration of activity;

- Oversight of financial and workforce arrangements;
- Communication of assurances.

The governance design activities and the process of governance were further refined during the lifespan of the project by a series of reviews and discussions about terms of reference and membership. The sub-tier below the Executive Board focuses on delivery, joint commissioning and what is called a CYP Summit whose aim is to widen network inclusion.

During the study period City Children's Network was itself subject to an Ofsted review, some incorrect and inflammatory publicity, and special discussions as part of the Annual Performance Assessment. With a network of this size and complexity, it was not possible to identify any single reticulist there. The network was supported by sophisticated websites and an e-document store which provided a sense of cohesion, as did the governance structure and service matrix. It is perhaps too early to assess and evaluate the impact of the network in respect of achieving its targets. One gets a sense of strong governance, accountability and scrutiny which is further reinforced by the presence of written, specific and measurable targets in the form of KPIs in the service matrix by which the network holds itself open to evaluation and scrutiny.

The network served a politically most sensitive client group with a high public profile. As such it was buffeted by a myriad of initiatives in policy and CYP guidance, the latest of which, the Apprenticeship, Skills, Children and Learning Bill, issued more guidance, making further demands of Children's Trusts and their boards. These demand are re-printed below from the Government Office (for the area concerned) to indicate the range of activities which had to be met for the production of a CYP Plan. In City Children's Network the structural and governance arrangements appeared to be in place to achieve these aims.

Table 37. City Children's Network: activities mandate for production of CYP plan

Preparing the plan	Each plan must have a statement on how the CTB will make improvements in the ECM outcomes with specific reference to:- Integrating services provided by the CTB partners to improve the well-being of children and young people. Arrangements to safeguard and promote the welfare of children. Arrangements for early intervention and preventative action through universal services. Arrangements for reducing child poverty. It will also have to include:

	A list of those consulted in preparing of the plan. A joint needs assessment for children, young people and families against the ECM outcomes. An outline of the main improvement priorities, especially for children and young people with special educational needs, disabled children and looked after children, for the five ECM outcomes. All relevant targets to improve well-being across the outcomes. An outline of the strategic actions planned by each of the CTB partners to achieve the improvements. An outline of how the plan will be performance managed and monitored by the CTB. A strategy for the local workforce to deliver the priorities in the plan. Arrangements for strategic commissioning of services for children and young people specifying the proposed spend and resourcing commitments of each CTB partner on each of the plan's key priorities.
Consultation	The CTB must consult:- (a) People or bodies included in Children's Trust arrangements under the Children Act 2004. (b) Relevant partners prescribed in regulations that are not represented on the CTB. (c) Children, young people, families and carers as the CTB consider appropriate, with an emphasis on the hard to reach. (d) All Sure Start Children's Centre Advisory Boards in the area. (e) Persons or bodies representing children, young people, families or carers as the CTB considers appropriate. (f) Other faith groups as the CTB considers appropriate. (g) Schools forum and schools admission forums.

CTB = Children's Trust Board. ECM = Every Child Matters.

Case D: Small CHD Network

This network originally centred on a PCT which has tended to be an 'early adopter' of organisational and policy innovations. The city has areas of economic and social deprivation, and a sizeable Asian population. CHD was therefore likely to be a substantial health problem. PCT mergers also gave

this PCT a rural hinterland. Earlier studies there had given the researchers a background knowledge of the PCT's organisational character and development.

The CHD network was established in 1998 before the publication of the National Service Framework (NSF) for Coronary Disease. The original network was established as a clinical (i.e. care) network whose aim was to improve services and access to services in an area with a very high incidence of heart disease. There was an existing tradition of close working relationships between primary and hospital based clinicians (both for secondary and tertiary care). The network's membership consisted of commissioners, senior hospital and primary care clinicians and managers. The local network was nested within a sub regional CHD collaborative which was also tasked with implementing the cardiac NSF. Although the commissioning agencies went through a series of reorganisations from Health Authorities to smaller Primary Care Groups (PCGs) to Primary Care Trusts (PCTs) and then merged PCTs, there was continuity of the leadership and facilitators of both the local and sub regional networks.

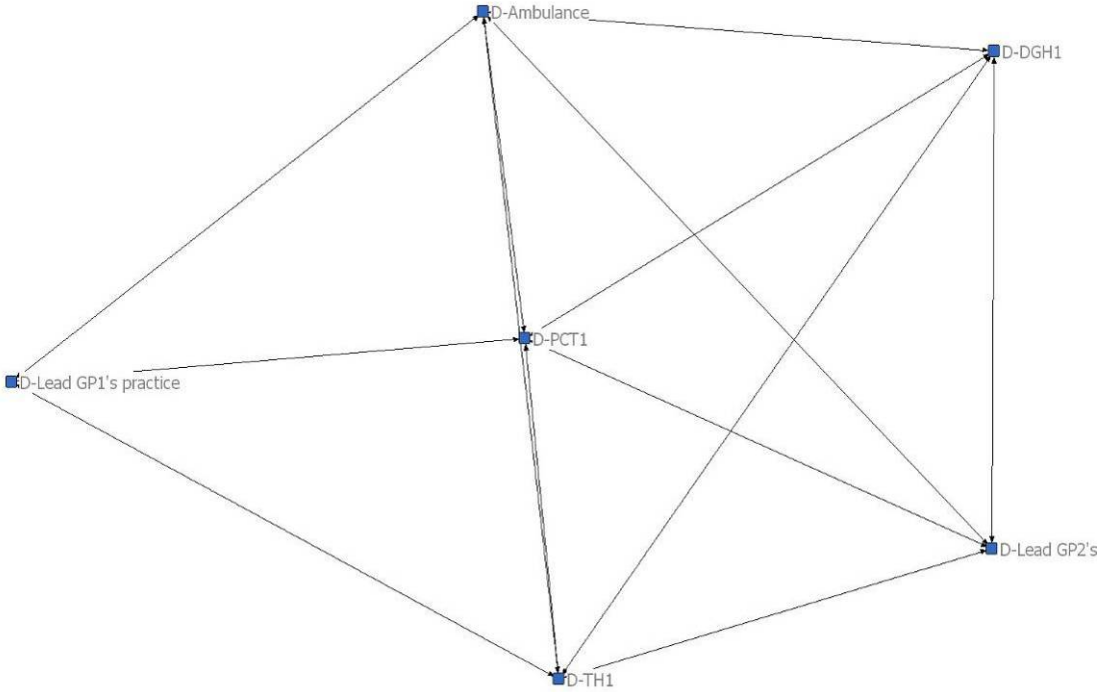
Both the local and sub regional networks were organised using a structure of steering group and sub-groups. The sub groups would address specific issues such as primary angioplasty, hospital transfer and diagnostics. The network's co-ordinating body had managed to establish the network's reputation as being an efficient, well-organised network. It was at the subgroup level that patients were engaged in the network's activity although the technical and professional language typically used was at times a barrier to their full participation.

Key outputs from the local and sub regional network included detailed guidance which tailored the NSF for CHD for local use. The network adopted the commonly used 'technology' of service improvement and redesign, for example process mapping existing patient routes through care and then redesigning those pathways. The redesigned pathways were then commissioned across the organisations within the local and sub-regional networks. The benchmarking of the performance of services against others was also cited as a standard technique for evaluation and development. The network claimed credit having developed a new primary angioplasty service for the sub region and for increasing the uptake of cardiac rehabilitation services.

The stated values and objectives of the network included the valuing of collaboration itself as a means of improving services; the pursuit of clinical excellence; an explicit valuing of clinicians' contributions to the design and commissioning of local CHD services; equity in access to CHD services; and an explicit valuing of the continuity in network membership despite the mergers and restructuring of PCTs; and change from which the network

wished to insulate itself. From 2008, however, this attempt at insulation broke down and the network entered a period of hiatus whilst, following the merger and restructuring of local PCTs and sub-regional cardiac network, it awaited its own reconfiguration.

Figure 7. Network map: Small CHD Network



Case E: Regional CHD Network

The development of Regional CHD Network can broadly be divided into three phases.

Phase 1: Co-existence and merging of local networks

At the time of PCT restructuring (from 2006) two main CHD networks, former collaboratives, covered the wide area (population around 4 million) which Regional CHD Network subsequently served. Each collaborative covered about half the region, each half-region containing a number of counties and unitary authorities. In 2006 the SHA carried out a consultation exercise about the future of these and other networks which resulted in the existing networks being amalgamated. In April 2007 the SHA established

cardiac, stroke, renal and diabetes networks across the entire region under the umbrella of the Regional CHD Network. This merged the existing two sub-regional CHD networks and incorporated other clinical specialities such as stroke. The SHA also established other new networks across the entire region for other care groups including for cancer and children. Regional CHD Network thus inherited a large catchment population, about twice that recommended in some policy guidance.

Concurrently with the two sub-regional collaboratives there also existed more local, PCT-level cardiac networks including one on which we initially focused our case study and which we label 'local CHD network E1'. It was set up in about 2000 by the then director of public health as a means of implementing the NSF for Coronary Heart Disease. It was organised across three PCTs (which subsequently merged) and its membership included health care professional and patient representatives from five main towns in the merged PCT. Its professional members were from general practice, primary care and specialist nursing, pharmacy, public health, cardiology, rehabilitation, cardiology administration and tertiary care. The focus of local network E1 was service improvement and it appears to have been successful in its early years. It helped to establish four local consultant posts, an angioplasty unit, a coronary care unit and well supported clinics. They also introduced integrated care plans in local network E1 for all levels of cardiac care and developed treatment guidelines on heart failure, angina and other coronary conditions.

Phase 2: Decline of the local CHD network and a hiatus for Regional CHD Network

Local CHD network E1 effectively ceased to function by 2007 and possibly much earlier, although it continued to meet irregularly during the course of the fieldwork. The exact causes and dates of its demise are not clear. The 2006 re-organisation of PCTs meant that the three PCTs that created local network E1 were merged into one. This increase in size seems to have caused a loss of local focus which meant network members dropped out. It is also possible that Practice Based Commissioning consortia replaced some functions of local network E1: it is hard to be absolutely certain that these developments influenced the demise of local network E1 but the timing is remarkably close. Our approaches to key informants to discover what had happened nearly all met with initial agreement but subsequent withdrawal from being interviewed or that phone calls and emails were not returned.

Meantime difficulties with staff recruitment frustrated the work of Regional CHD Network. The original network manager left her post in November 2007. It was not until June 2008 that a permanent network manager was appointed but her scope for action was constrained by the SHA's difficulties

in recruiting other key staff to support this and the other networks. Four service improvement manager posts were filled by the autumn of 2008, but two by secondments. At this stage Regional CHD Network had 0.4wte of a service improvement manager allocated to it. Staff recruitment was frustrated by uncertainty about the location of the network's co-ordinating body. It had always been intended that the network's host organisation would change from the SHA to one of the PCTs but a final decision remained unmade throughout much of 2008. A work plan was agreed but the lack of network support staff constrained its implementation. At this point the staffing plan was changed so that Regional CHD Network (like other care group networks) would have a full time dedicated manager, a deputy, a service improvement or project manager and administrative support. By the end of the year the Regional CHD Network had a full – indeed enhanced - compliment of a network manager, a deputy, a service improvement manager, a project manager and administrative staff.

Phase 3: Regional CHD Network re-animated

The appointment of a network manager in June 2008 enabled Regional CHD Network's work to begin effectively begin. The network now consisted of a steering group of five managers (including dedicated network managers) and six clinicians, including a nurse. It works through 36 liaison representatives from the region's provider and commissioning services. There is a roughly equal split between the number of clinicians and managers. Like other networks in this region, Regional CHD Network is accountable to a Board of Commissioners whose members included PCT CEOs and SHA executives. Until recently, Regional CHD Network's staff were employed by the SHA under the aegis of the head of service improvement and the director of clinical standards but management of network staff has now been transferred to a PCT acting as host for the network.

By the spring 2009, the network and its sub-groups had become progressively active in implementing work plans, developing guidance, standards, care pathways and other projects directly bearing upon clinical practice for CHD. Meantime Regional CHD Network staff were also involved in re-organising the network by, for example, identifying names of network members, creating contact lists and identifying clinical leads for stroke. During this period Regional CHD Network developed two main roles. One of the main early tasks of the new network manager was to get a work plan agreed by the board in July 2008. The work plan identified among the priorities for Regional CHD Network work on angioplasty provision, vascular surgery and demand for stroke services. One early activity was therefore to host an expert conference that resulted in proposals on care pathways, clinical practice and other components for angioplasty treatment. The network produced detailed commissioning options for its Board regarding

the location, volume and costs of these services. Network also produced detailed recommendations about pace-maker use with patients who fall outside NICE criteria. Its work plan specifies that Regional CHD Network is to have both a service provider and improvement function and a commissioning development function, although (lead clinicians were clear) Regional CHD Network would in due course shift focus towards commissioning support.

Case F: Urban CHD network

The network's precursor was a CHD Collaborative that had emerged between 2001/2002, and which in 2003/2004 developed as a full administrative network as a result of the amalgamation of the Collaborative and the Local Cardiac Modernisation Board. This history was still represented in the Network's present form in that it was very collaborative in its approach and had high levels of innovation – seeking to operationalise the modernisation ethos, and purposefully change and improve both the organisation and practice of cardiac care. The network served a large conurbation with a planning population of about 2 million people; however, it had porous boundaries on all sides and the planning population was only one indicator of its work-flow because historical clinical referral patterns at both primary and tertiary levels of care spread beyond its immediate planning population.

The network served seven PCTs and five acute Hospital Trusts (with multiple sites within each Trust), which included tertiary centres. The network served eight local authority boroughs and, prior to 2008, was part of a strategic health authority arrangement which later merged into a city-wide authority. The network's burden of disease in respect of cardiac mortality was high, representing five of the worst six boroughs in the whole city. 2001 census data showed similar patterns exist for circulatory disease and coronary heart disease mortality. It is important to note that to members of the network, none of the operating conditions and epidemiology which they were working with were new. The patterns had existed and endured for decades, and one of the clear objectives of the network was to improve the health status of the area with a focus and drive which was stimulated by the combination of the overall National Service Frameworks for Coronary Heart Disease, the previous Heart Improvement Programme, and the performance mechanisms of Public Service Agreements (from HM Treasury) with performance management and scrutiny requirements of the SHA.

Throughout the period of the study, this overall innovation and performance agenda changed – in fact it was in a state of perpetual development. Partly this was because in clinical terms it was not possible to separate the CHD NSF from other ones, particularly those for blood pressure, COPD, stroke

and vascular. In fact, midway through the study period the network took on the extended responsibility for the stroke and vascular NSFs. There were further complexities in the network's environment: the wider NHS 'reform' agenda, practice-based commissioning and Payment by Results. For the later, second tranche of interviews, the respondents articulated how the publication of Chapter 8 of the NSF CHD – on arrhythmias and sudden cardiac death – was serving as further stimuli to action resulting in the modification of local work plans.

The network was organised around a highly functional Cardiac Network Board which was fully chaired and serviced, with an 'above' and 'below' structure; the 'above' structure being the representational engagement and service delivery/accountability part of the network, and the 'below' section the full time, permanent administrative and managerial structure of the network. Much of the work of the 'below' section was fed and driven by Service Improvement Teams who 'worked in the field', so uniting the 'above' and 'below' structures very effectively. Our interviews confirmed the mixing and blending of these structures in that relationships existed between the network core and its hinterland. The administrative and managerial core of the network had a designated physical location and office facilities which added to the sense of a tangible network both in effect and structure. The sense of innovation was strong with administrative staff encouraged to further develop both personally and professionally, and internal communication networks were short and dense with daily contact between members. The clinical leads and directors were seen as the boundary spanners and network reticulists and the functionality of the network was further enhanced by examples of highly collaborative behaviour.

The main activities of the network were to co-ordinate, steer, direct where appropriate, bring together and facilitate the improvement of cardiac health care and access to such services as achieve this, for its local population in line with the requirements of the NSF CHD by working with all the component stakeholders. It did this by providing evidence, information, liaising, educating, innovating, advising, introducing all stakeholders, sharing, and perhaps above all, by taking a holistic view of the whole patient journey in cardiac care and identifying where, in that journey, each interfaces with each service, and then bringing all these interfaces together in a network and when required to participate in the commissioning of services.

Its artefacts have been written strategies and directional guidance about prevention, angina, revascularisation, heart failure, cardiac rehabilitation, arrhythmia and cardiac palliative care. The network achieved particular impact with the initiation of a Heart Attack Centre and the commencement of primary angioplasty which involved intensive and complex negotiations,

leading to service changes at a strategic and operational level, e.g. from implementing the broad requirements of the NSF to agreeing detailed schedules of the ambulance service that fit in with the new Heart Attack centre. Further impacts were achieved with workforce development, particularly around catheterisation, laboratory staff, movements toward the 18 week waiting target from GP referral to hospital treatment, and also in respect of cardiac rehabilitation.

The network was helped by its pre-existing network relationships; the presence of a single administrative unit, both physically and in terms of staffing; the skills and commitment of its members; its location amongst a highly innovative, clinically renowned set of tertiary centres; the support of the DoH, plus effective and strong leadership. Its demanding environment and structural changes to the NHS locally required the network's constant re-adaptation.

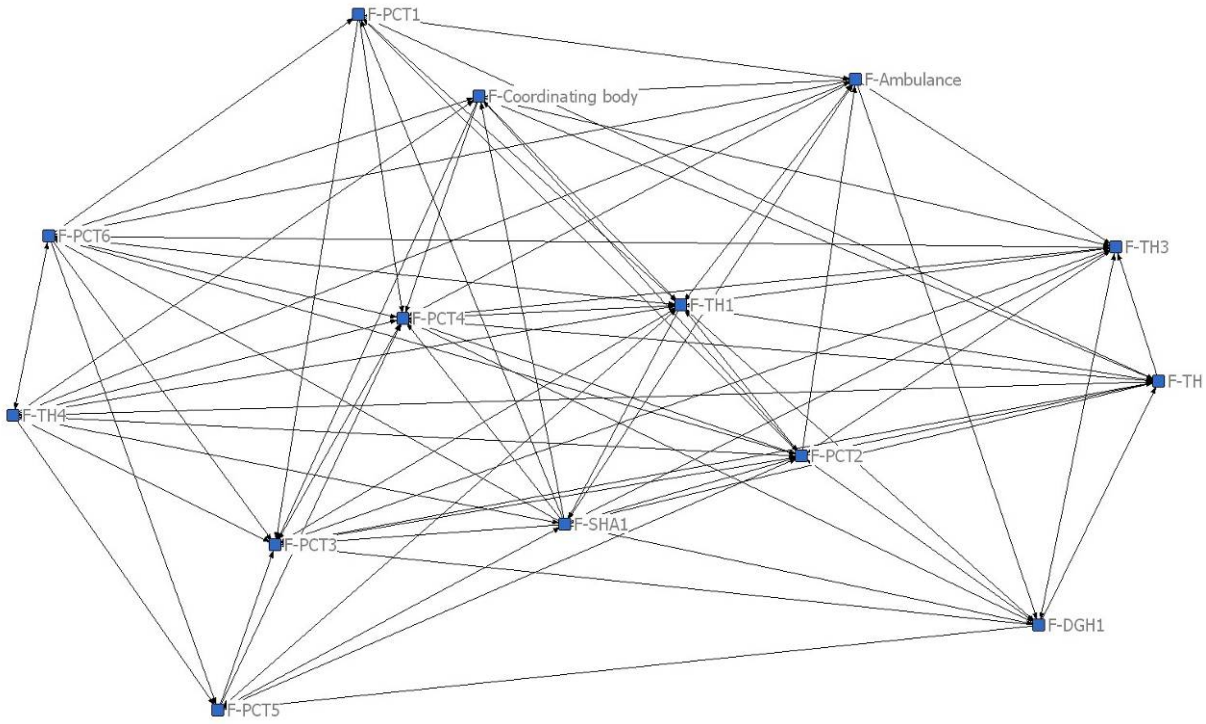


Figure 8. Network map: Urban CHD Network

Case G: Self-Care Network

This was a small voluntary network which works towards supporting and improving the physical well being of adults with mental health difficulties. It was initiated in 2006 by a group of these adults whose initial common link was activities at a social club in one district of the city. Although one interested local GP and a social service manager also participated, this network was above all a self-help and mutual support network. Self-Care Network consisted of three voluntary groups located in the north west of a small city, providing physical activities to local people with severe mental health problems. The voluntary groups are supported by the local PCT and a city-wide voluntary group. The main input from these organisations was through a local GP, a public health manager, public health workers and a physical activity promoter. NIMHE provided £5, 000 funding to Self-Care Network over three years.

The largest voluntary member organisation in Self-Care Network was a partnership between a Baptist church and the city Mental Health Partnership promoting activity and group work for people with severe mental illness. Its running costs of £80,000 pa were funded by the city council and covered the salaries of a full-time co-ordinator, a part time administrator, sessional workers and overheads. The second voluntary member organisation was a self-help group of people with long term mental health problems, based in a nearby suburb. The third voluntary member organisation operated a weekly drop-in centre providing a range of physical, educational and social activities. The two smaller voluntary organisations got occasional small grant funding but were entirely voluntary run, supported by small fund raising activities such as raffles.

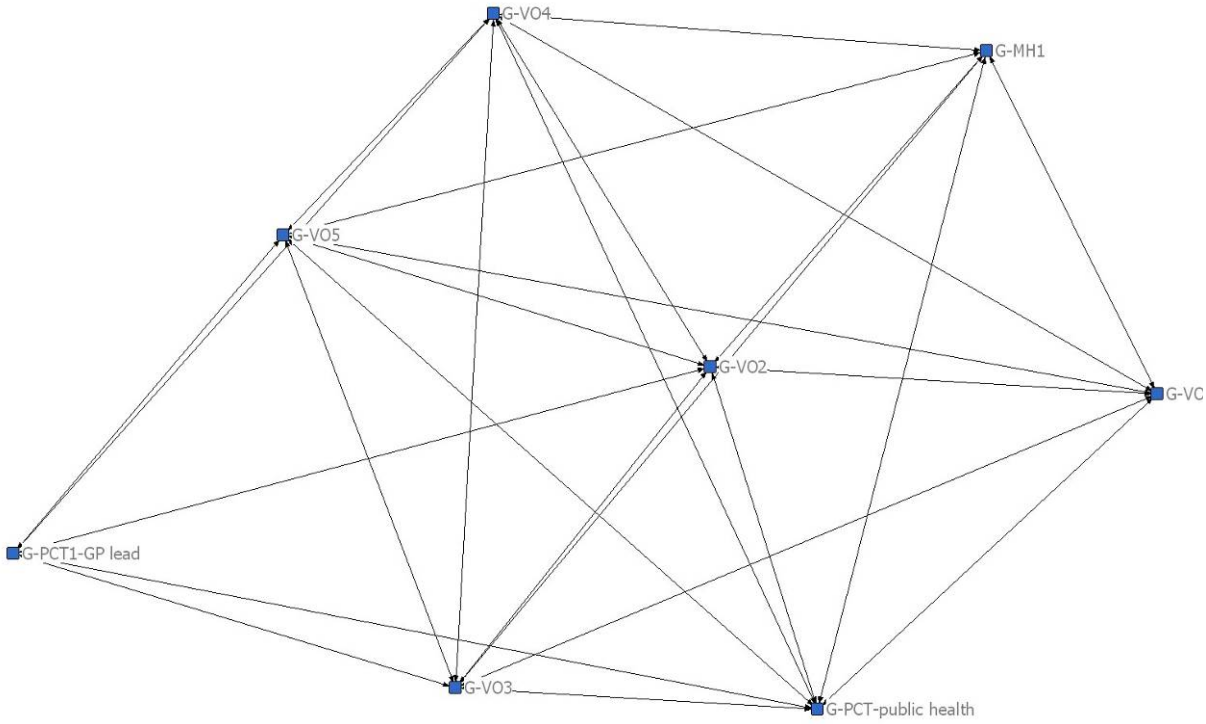
Before Self-Care Network was established, all three of what were to become its voluntary member organisations had already been organising regular physical activity sessions. The objectives of Self-Care Network were to:

- Develop a network of health promoting activities to be used by people with long-term mental health problems
- Increase the number of people with long-term mental health problems eating healthy food, doing moderate exercise, stopping smoking and with an increased sense of well-being
- Develop confidence and capacity of third sector providers to engage in health promoting activities
- Increase links between health and other sectors

The age range of those attending Self-Care Network events was very wide (20 to 81 years old), yet all participated irrespective of age. The participants reported feeling more capable, confident and a sense of achievement as a

result of taking part in Self-Care Network activities. They felt that such success owed a great deal to Self-Care Network and the largest voluntary member organisation providing a social network to those that would not otherwise find it given that many live on their own and become very isolated. Self-Care Network activities provided social interaction and, we were told, relief from anxiety and depression. Self-Care Network won a regional health and social care award for Improving Health and Reducing Inequalities. Self-Care Network have also learnt to start recording their achievements. This is has enabled them to make funding applications for small grants, some of them successful. Self-Care Network organised a wide range of activities for its members, such as food preparation courses, exercise and sports events, and trips out. A public health professional provided health advice to Self-Care Network members and made referrals to GPs to deal with high blood pressure, obesity and smoking. A practice nurse visited the groups to give health checks (which also raised the nurse's awareness of how to deal with people with mental health problems).

Figure 9. Network map: Self-Care Network



Appendix 2 Data grid for case studies

version = 11 June 2006

NR89 Phase 1 fieldwork - Data Grid

One column per network, row headings shown below:

* = data required to set up quantitative analysis.

Environment of the network

1. Policy context role of national-level institutions (DH, DEnv, NICE etc.)
   (a) Mandation (if applicable) – by whom, for what purpose, what incentives and/or sanctions
2. Legal and regulatory framework:
3. Professional bodies – nature and extent of regulation of network members
4. Whole-network *external* resource dependences and their institutional structure (volunteers? market? public budget? gift? grant? etc.). (These identify the possible network 'layers'.)
   (a) users (patients, clients or equivalent)*
   (b) staff (including volunteers) *
   (c) money (all sources)*
   (d) knowledge / information *
   (e) legitimation i.e. legal/regulatory/professional recognition/permission *
   (f) physical resources (equipment, consumables, accommodation) *
   (g) others? *
5. Stability of environment
   (a) main changes during past 3 years
   (b) main changes foreseen in next 3 years
   (c) in/stability of workload
6. Any similar networks:
   (a) earlier, that anticipated (or became) the present network?
   (b) elsewhere – non-competing
   (c) competing / substitute

Structure of the network

1. Membership ('stakeholders') – who are they?
   (a) organisations *
      i. inclusivity and any exclusions *
      ii. individuals who 'boundary span' to each other network member organisation*
      iii. boundary-spanner's prior role, accountabilities and incentives faced within his/her home organisation
   (b) individuals*
      i. inclusivity and any exclusions *
   (c) sub-networks
   (d) embedded within any other
      i. network(s)?
      ii. larger organisation?
2. Division of labour – any specialist roles or contributions of
   (a) organisational members
   (b) individuals
   (c) service clients or users (including proxy users such as carers)
3. 'Technology' by which the network undertakes its core activity i.e.
   (a) nature of the common activities which the network undertakes *
   (b) who directly interacts with whom, in undertaking this activity *
   (c) how far the core activity takes place within member organisations, how far it results from interactions between them *
   (d) its resource requirements i.e. external resource dependencies above *plus* internal resources supplied by the network members. Same categories as above i.e.:
      i. users (patients, clients or equivalent) and their inputs*
      ii. staff (including volunteers) *
      iii. money (all sources)*
      iv. knowledge / information *
      v. legitimation / authority / permission *

vi. physical resources (equipment, consumables, accommodation) – their asset specificity *

vii. others? *

4. Infrastructure: Relational co-ordination structures

(a) network core?

i. membership of core *

ii. how core selected / elected

iii. functions *

iv. resources

A. nature and quantity

B. property rights

C. who provides these resources and how

D. who controls what budgets

v. incentives or sanctions of

A. core upon (other) network members

B. other network members upon core

(b) standing committees or working groups *

(c) ICT infrastructure, in particular e-mail and its role *

<u>Organisational processes of the network</u>

In each case, note any benign and any dysfunctional aspects, implications, consequences.

1. Formation of network: how members are recruited

(a) recruitment mechanisms and criteria – open or closed network?

(b) organisations' reasons for supporting the network

(c) individual members' reasons for supporting the network

(d) How members are lost / expelled (criteria, mechanisms)

2. Objective setting – what is the stated purpose of the network, its core activity and intended outcomes?

(a) who sets network objectives

(b) by what processes

(c) what objectives does the network have

(d) degree of consensus, support or opposition among network members for these objectives

(e) leadership styles – shared vs. distributed.

3. Relational co-ordination processes and who participates in each of these 'layers' of network processes? *

(a) Resource allocations and flows:

i. help in kind e.g. loan of materials, staff secondments; and which members are involved? *

ii. referrals: and which members are involved? *

iii. gifts / grants: and which members are involved? *

iv. transactions / contracts: and which members are involved? *.

v. delegation of budgets / staff / decisions from member organisation: and which members are involved? *

(b) information exchange: and which members are involved? *

i. Which information is shared, and which is not? *

ii. How data are collected

iii. How data are analysed and the information flows following

(c) joint learning / training / self-development among network members: and which members are involved? *

4. How network activity is jointly assessed.

(a) transparency and surveillance – e.g in regard to clinical governance

(b) compliance with network objectives and activities - incentives or sanctions

5. Social capital; trust, affiliation and conflict

(a) shared assumptions, beliefs, value – network

i. 'culture'

ii. 'climate'

iii. 'ideology'

iv. Are contracts a source of stress for voluntary organisations?

(b) socialisation into the network

(c) mutual support vs. any conflicts or disputes, dissident members, active or passive resistance from any network members or groups thereof. Any conflicts of interest between providers?

(d) How uniformly do network members participate in its activities?

(e) Incentives to collaborate and their effects

i. negotiations / persuasion: and which members are involved? *

ii. legitimation

iii. soft coercion?

6. How member organisations' internal activities constrain or influence their role in the network and the network's activity

(a) role of boundary spanners – as agents of their 'home' organisation acting upon the rest of the network *

7. how the network activities constrain or influence what occurs within their member organisations

(a) role of boundary spanners – as agents of the network acting upon their 'home' organisation *

8. How changes occur in network's core activity – openness to innovation

<u>Outcomes of network activity</u>

1. Effectiveness:

(a) How network activities compare with network's own stated objectives

i. implementation surpluses or deficits

(b) Accessibility to services – range and speed of access.

(c) New referral routes

(d) How far minimum standards, including safety standards, apply.

(e) Any secondary data on services outcomes, quality of life etc.?

2. Accountability:

(a) How network activities compare with mandator's requirements (where applicable)

(b) User involvement in decision-making; types and levels of involvement.

3. Outcomes for members

(a) How network activities compare with member organisations and individuals' reasons for supporting the network

(b) Differences in different stakeholders' criteria for satisfactory network outcomes

(c) Stress in networks [compared with other work settings]

(d) Intrusiveness (or not) of networks' monitoring / surveillance methods.

4. Costs, opportunity costs.

(a) Net benefits & marginal costs compared with other forms of governance.

Appendix 3 Mandated and voluntary networks

Table 38. Mandated and non-mandated networks: Initial assumptions (A) and hypotheses (H)

	Mandated	Non-mandated
Origins (A)	Created by legal requirement for practice; collective agreement between profession and state; 'closed shop' or cartel; or by managerial direction. Some involuntary members.	Voluntary pursuit of common policy goals; shared economic interests; shared technology; network created as by-product of other, de facto relationships and organisational structures.
Structure (H)	'Hierarchical' in the sense of having public organisation as a core body; 'enclave' in the sense of having a formally defined membership; low density; flow is mainly from core to periphery; relatively consistent separation (all members relate directly to the core, and to each other mainly via the core). Uniform networks (within the economic sector). Closed membership.	Negotiated, distributed allocation of roles; open to new members and liable to lose members; more external links; patchy density and flow; uneven distribution of structural holes; uneven separation. Each network was particular structural characteristics. 'Market' and 'individual' substructures. Sub-networks emerge; 'lumpy' networks.
Organisational processes (H)	Explicit common goals and activities. Uniformity and formalisation of organisational processes and flows. More comprehensive, systematic management of the whole network. Tendency to 'vertical' control (from core to other members). Oppositional processes occur, both passive (self-isolation, non-compliance) and active. Dissent by 'voice' or passive opposition not 'exit'. Prior networks co-exist with new	Tendency to more 'horizontal' co-ordination between members. More 'relational' processes and flows, more trust-based. Conflict dealt with by negotiation or exit. New members recruited *ad hoc*. Heterogeneity of occupations included. Shifts over time in the distribution of power amongst network members (Moody et al 2005). Inter-group brokerage ('structural holes') allow exchange of ideas. Social networks' processes more likely to

	mandated network.	emerge to serve non-rational and irrational needs (Kahn et al 2003; Kravitz et al. 2003).
Technical process and Outcomes (H)	Swift, relative uniform implementation of mandated policy and activities in the short term. Limited openness to organisational innovation, involvement of service users. Hence, more limited long-term outcomes than in non-mandated networks.	Flexibility and openness to innovation (both organisational and technical). Especially those: 1. invented or promoted by grass-roots enthusiasts 2. introduced by boundary-spanners / structural holes (Burt 1992). Service user involvement more extensive but uneven.

Appendix 4 Co-ordination benefits and disbenefits of trusting

Co-ordination benefits of trusting (82)

- Avoids costs associated with extensive monitoring and oversight
- In some contexts serves as a better control mechanism than either markets or hierarchies.
- Can promote openness and sharing of timely and accurate information
- May enhance personal motivation because of increased levels of freedom and autonomy
- Serves as an intangible capital asset which can secure competitive advantage.
- Basis for forging and maintaining partnerships, strategic alliances and professional networks
- Associated with enhanced employee satisfaction and performance.
- Promotes more rapid innovation and learning in organisations
- Reduces complexity and information paralysis

Co-ordination drawbacks of trusting

- Up front costs of building and maintaining trust can be high. However once trust has been established it can be lost or damaged very easily.
- Difficult to establish who is a trustworthy agent, especially in areas where past performance might not be a good indicator of future performance.
- Is a risky investment as the trustee may behave opportunistically by exploiting the vulnerability of the truster or fail to perform to expectations.
- Can lead to dysfunctional 'cosy' relationships, which stifle motivation and at the extreme may lead to corrupt practice.

Appendix 5 Interview schedule

Instructions to interviewer

Before starting interview:

1.Check interviewee has seen PIS.

2.Invite interviewee to ask any questions about the research and his/her role in it.

3.Ask interviewee to sign consent form (one copy for interviewee, one for researchers).

4.Ask permission to tape-record.

5.Offer interviewee opportunity to see and correct transcript.

Checklist of topics

Interviewer to select ad hoc which of these to pursue with particular individual informants, according to the informant's role and what data is already available.

1 Network Aims

1.1 How did this network originate?

1.2 What are its stated aims?

1.3 What aims do you think it actually pursues?

1.4 Why do you participate in this network?

2 Network Environment

2.1 What external organisations does this network have the most dealings with?

2.2 What does this network need or obtain from these external bodies?

Prompts: (Funds? Referrals? Physical resources? Staff or volunteers? Permission to operate? Other resources?)

2.3 What do these outside bodies demand in return?

2.4 What are the main risks and uncertainties in dealing with these outside bodies?

2.5 How does national policy impact on this network?

3 Network structures

3.1 What is the main activity of this network?

3.2 Who co-ordinates and controls this activity, and how do they do it?

Prompts: Is there a designate co-ordinator or organising group? How much discretion do they have? Who do they report back to? How does a person become a co-ordinator/organising group member? Can they lose that role?

3.3 Who carries out this activity and how are they organised?

Prompts: Any 'horizontal' division of labour among network members or different parts of the network? Permanent roles or specialisations? Specialised work 'teams'? Ad hoc project teams? Informal co-operation between members of different occupations?

3.4 What physical resources does the network have at its disposal to carry out this activity?

Prompts: Buildings, land, tools, equipment? Information systems (IT)? Stocks of raw materials or consumables? Place(s) of service provision?

3.5 Does the network use any specialised technical or occupational knowledge?

Prompts: Evidence-based knowledge? Special protocols? Operational techniques such as care process mapping?

4 Network processes

4.1 What incentives are used to motivate and manage individual members of the network?

4.2 How does the network relate to the non-members (patients, clients, customers, general public) who make use of its services? If they participate in decision-making, how is this done?

4.3 What has made this network grow / shrink / remain unchanged?

4.4 What norms or values predominate within this network?

Prompt: 'norms or values' could be paraphrased as internal 'climate', 'culture', 'rules', 'ideologies' 'orientation', 'legitimation', 'authority'.

4.5 Have any conflicts occurred within this network during the last three years? What were they about? By what process were they resolved?

5 Network outcomes

5.1 What does this network provide for the people (patients, carers) who use its services?

Prompts: Access to services? Help in kind? Emotional or psychological support? Support in managing their own health care? Information? Support for the family or other informal carers?

5.2 In your opinion, what seems to make people join or leave this network, or its activities? What do they seem to like or dislike about it?

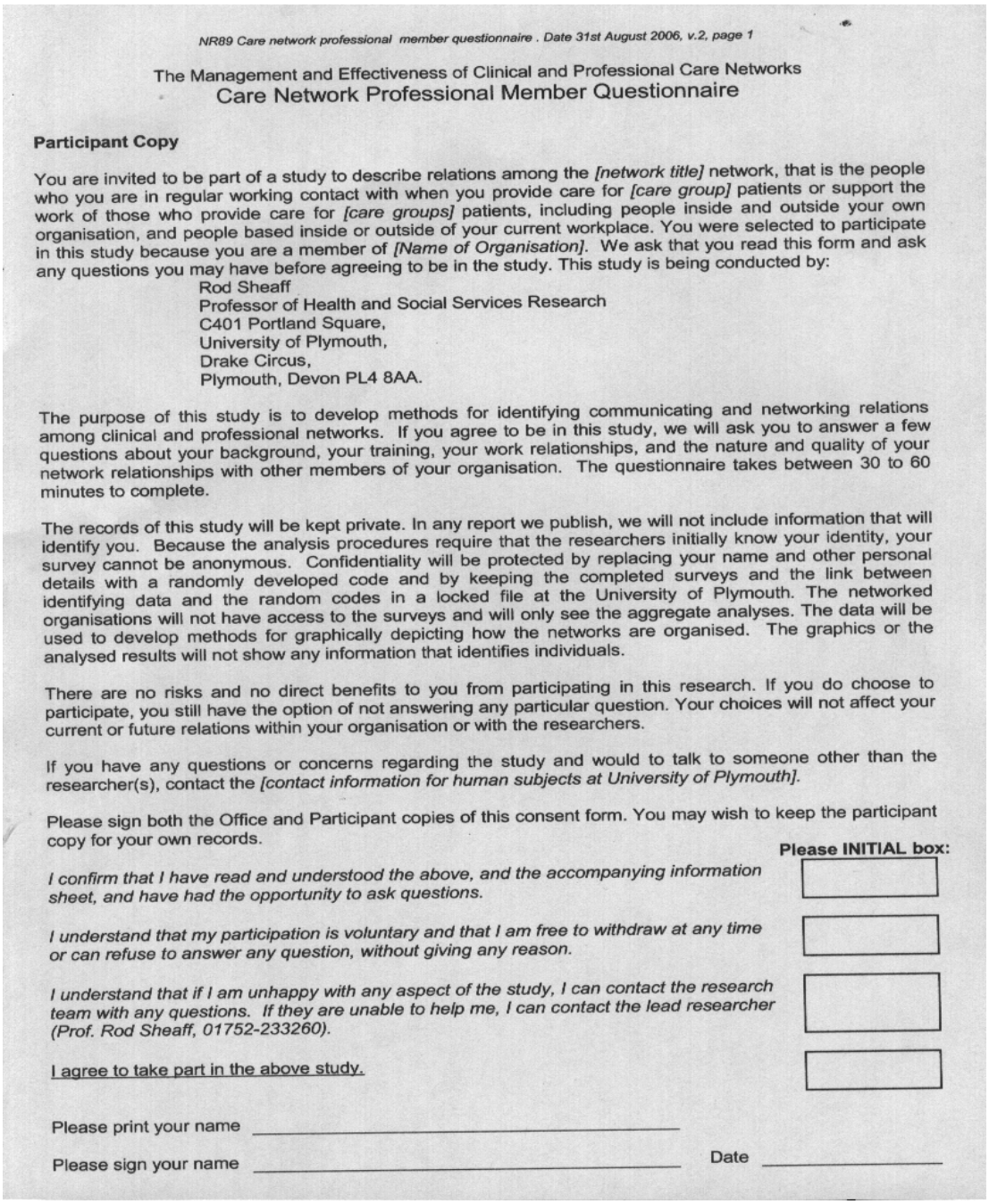
5.3 What do your regard regard as success (or failure) in what this network does?

Prompts: Innovative ways of providing services? Promoting evidence-based practice? Spread of knowledge, skills or ideas? Patient of carer satisfaction? Health outcomes? Demand management?

6 Are there any other important aspects of this network which you have not yet had the opportunity to describe?

Appendix 6 Survey questionnaire

Below is the generic framework for the survey questionnaire, set up with dummy organisational names (our ethical approval requires anonymity of informants and sites).



NR89 Care network professional member questionnaire . Date 31st August 2006, v.2, page 1

The Management and Effectiveness of Clinical and Professional Care Networks

Care Network Professional Member Questionnaire

Participant Copy

You are invited to be part of a study to describe relations among the *[network title]* network, that is the people who you are in regular working contact with when you provide care for *[care group]* patients or support the work of those who provide care for *[care groups]* patients, including people inside and outside your own organisation, and people based inside or outside of your current workplace. You were selected to participate in this study because you are a member of *[Name of Organisation]*. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by:

Rod Sheaff
Professor of Health and Social Services Research
C401 Portland Square,
University of Plymouth,
Drake Circus,
Plymouth, Devon PL4 8AA.

The purpose of this study is to develop methods for identifying communicating and networking relations among clinical and professional networks. If you agree to be in this study, we will ask you to answer a few questions about your background, your training, your work relationships, and the nature and quality of your network relationships with other members of your organisation. The questionnaire takes between 30 to 60 minutes to complete.

The records of this study will be kept private. In any report we publish, we will not include information that will identify you. Because the analysis procedures require that the researchers initially know your identity, your survey cannot be anonymous. Confidentiality will be protected by replacing your name and other personal details with a randomly developed code and by keeping the completed surveys and the link between identifying data and the random codes in a locked file at the University of Plymouth. The networked organisations will not have access to the surveys and will only see the aggregate analyses. The data will be used to develop methods for graphically depicting how the networks are organised. The graphics or the analysed results will not show any information that identifies individuals.

There are no risks and no direct benefits to you from participating in this research. If you do choose to participate, you still have the option of not answering any particular question. Your choices will not affect your current or future relations within your organisation or with the researchers.

If you have any questions or concerns regarding the study and would to talk to someone other than the researcher(s), contact the *[contact information for human subjects at University of Plymouth]*.

Please sign both the Office and Participant copies of this consent form. You may wish to keep the participant copy for your own records.

Please INITIAL box:

I confirm that I have read and understood the above, and the accompanying information sheet, and have had the opportunity to ask questions.

I understand that my participation is voluntary and that I am free to withdraw at any time or can refuse to answer any question, without giving any reason.

I understand that if I am unhappy with any aspect of the study, I can contact the research team with any questions. If they are unable to help me, I can contact the lead researcher (Prof. Rod Sheaff, 01752-233260).

I agree to take part in the above study.

Please print your name _____

Please sign your name _____ Date _____

Office Copy

You are invited to be part of a study to describe relations among the *[network title]* network, that is the people who you are in regular working contact with when you provide care for *[care group]* patients, including people inside and outside your own organisation, and people based inside or outside of your current workplace. You were selected to participate in this study because you are a member of *[Name of Organisation]*. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by:

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The purpose of this study is to develop methods for identifying communicating and networking relations among clinical and professional networks. If you agree to be in this study, we will ask you to answer a few questions about your background, your training, your work relationships, and the nature and quality of your network relationships with other members of your organisation. The questionnaire takes between 30 to 60 minutes to complete.

The records of this study will be kept private. In any report we publish, we will not include information that will identify you. Because the analysis procedures require that the researchers initially know your identity, your survey cannot be anonymous. Confidentiality will be protected by replacing your name and other personal details with a randomly developed code and by keeping the completed surveys and the link between identifying data and the random codes in a locked file at the University of Plymouth. The networked organisations will not have access to the surveys and will only see the aggregate analyses. The data will be used to develop methods for graphically depicting how the networks are organised. The graphics or the analysed results will not show any information that identifies individuals.

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If you have any questions or concerns regarding the study and would to talk to someone other than the researcher(s), contact the *[contact information for human subjects at University of Plymouth]*.

Please sign both the Office and Participant copies of this consent form. You may wish to keep the participant copy for your own records.

Please INITIAL box:

I confirm that I have read and understood the above, and the accompanying information sheet, and have had the opportunity to ask questions. ☐

I understand that my participation is voluntary and that I am free to withdraw at any time or can refuse to answer any question, without giving any reason. ☐

I understand that if I am unhappy with any aspect of the study, I can contact the research team with any questions. If they are unable to help me, I can contact the lead researcher (Prof. Rod Sheaff, 01752-233260). ☐

I agree to take part in the above study. ☐

Please print your name _____

Please sign your name _____ Date _____

Please enter your contact details below. Your contact details will be treated confidentially and not be divulged to any other organisations. They will only be used for administration purposes within this project.

Address: _____

_____

_____

_____

City: _____

Post Code: _____

Telephone Number: _____

E-mail address: _____

We may need to contact you in the future regarding this research. Please indicate if you agree to being contacted in the future by ticking the appropriate box. Thank you.

Yes, I agree to being contacted with further queries. ☐1

No, please don't contact me with any further queries. ☐2

Part 1

You have been asked to participate in this questionnaire in your capacity as a member of *[network name]*. It is very important to our research that you complete this questionnaire and return it to us, **even if you do not feel** that you are an active member of this network.

1. I do regard myself as an active member of *[network name]*

Yes ☐1 No ☐2

Please briefly outline why you do / do not regard yourself as an active member of this network.

_____

_____

_____

Please continue with the remainder of the questionnaire.

Part 2

2. What is the name and address of the organisation that the following answers are about?
Please select one only. If you work for more than one of these organisations, please select the one which you work the most hours for.

NAME OF ORGANISATION	✓	NAME OF ORGANISATION
Fictional PCT		
Imaginary NHS Trust		
Etc ...		
IF OTHER – Please enter details :		

3. In this organisation,
   a) What is your primary role?

_____

4. Do you have a secondary role (e.g. organising clinical groups, management, gathering performance data etc.)? If yes, please describe it.

5. In your capacity as a member of *[network name]*, do you sit on any **local** committees, advisory or steering groups, etc.?

a) Yes ☐1 No ☐2

b) If **Yes**, please list these (please include professional and special interest groups):

_____ _____

_____ _____

_____ _____

6. In your capacity as a member of *[network name]*, do you sit on any **regional** committees, advisory or steering groups, etc.?

Yes ☐1 No ☐2

If **Yes**, please list these (please include professional and special interest groups):

_____ _____

_____ _____

_____ _____

7. In your capacity as a member of *[network name]*, do you sit on any **national** committees, advisory or steering groups, etc.?

Yes ☐1 No ☐2

If **Yes**, please list these (please include professional and special interest groups):

_____ _____

_____ _____

_____ _____

8. This question asks about work-related interactions with staff within the network. Please answer for your own organisation as well as others. In this question:

Personally interact with someone means that you usually interact with them on at least one day a week, by e-mail, phone or face-to-face, about work-related matters.

Direct Patient care means all activities to do with caring for individual patients, including face-to-face contact, asking advice, and activities such as ordering tests and talking with patients on the phone.

Patient care organization means all activities to do with the general organization of patient care, such as developing care guidelines, giving/receiving information about good practice, and research.

Administration means all activities to do with administration, such maintaining patient records, budgeting, scheduling personnel, and performance measurement.

Help in kind means use of equipment, premises, consumables, staff time or other practical help.

Money includes transfers between budgets e.g. payments under practice based commissioning, NHS service agreements, grants, subsidies etc.

Tick a box only when *you personally* interact with someone from that organisation. Interactions may be formal or informal, inside or outside that organisation's buildings. If no interaction, leave the boxes blank.

Work-group or Organisation	Direct Patient Care	Patient Care Organisation	Administration	Help in kind	Money
[This column to be pre-filled from the master list of network organisations and work groups given in question 2 above. Below are two entries from that list elaborated with illustrative dummy names. NB The 'etc.' is included to allow for any omissions or changes in our list of persons at each site.]	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
Fictional PCT (Church Road Surgery; GP (Dr. Crippen), Nurse (Mrs. Blood) ... etc.	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
Imaginary NHS Trust (Cardiology Department; Consultants (Drs. A, B, C, Z)... etc.	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
	O	O	O	O	O
Others, please add as necessary					
	O	O	O	O	O
	O	O	O	O	O

9. Here are some additional questions about care processes. For each statement below, please tick the box that most applies to you personally

A care process is any aspect of routine care provided to patients, and includes the procedures used to select, deliver, evaluate and/or record the care given.

An allied health professional is anyone, apart from a doctor or nurse, doing clinical work (e.g. physiotherapists, pharmacists, laboratory technician).

If you last participated in an activity more than 6 months ago, please enter 'No' for that item.

		Within the last 6 months	No
		1	2
1	I have had the opportunity to provide feedback about changed or new care processes before they were fully implemented.	O	O
2	I talked with **doctors** outside my organisation about care processes that I am involved with.	O	O
3	I talked with **nurses** outside my organisation about care processes that I am involved with.	O	O
4	I talked with **allied health professionals** outside my organisation about care processes that I am involved with.	O	O
5	I talked with **professionals working for non-health organisations** about care processes that I am involved with.	O	O
6	I reviewed the clinical and care management literature for new ideas about care processes that I am involved with.	O	O
7	My ideas were solicited during the process of implementing changed or new care processes.	O	O
8	I participated in committees outside of my organisation that are working on care processes that I am involved with.	O	O
9	For care processes I am involved with, I tried to find data that compares the performance of my organisation with other organisations.	O	O
10	I participated in pilot projects to test changed or new care processes	O	O
11	I participated in organisation committees that were evaluating and modifying care processes.	O	O
12	I participated in quality improvement/problem solving cycles such as Plan-Do-Check-Act to improve care processes.	O	O
13	I made site visits to other organisations to see how they organize care processes I am involved with.	O	O
14	I participated in dry runs for changed or new care processes before they are fully implemented.	O	O
15	I received resource materials that have been developed outside my organisation that outline key articles and guidelines for care processes that I am involved with.	O	O

10. Here are some questions about everyday working relationships. For each statement below, please tick the box that most applies to you personally, in your role as a member of the organisation you selected above (in question 2).

A care process is any aspect of routine care provided to patients, and includes the procedures used to select, deliver, evaluate and/or record the care given.

		Strongly Agree	Agree	Unsure	Disagree	Strongly Disagree
		1	2	3	4	5
1	I feel comfortable checking with other members of my own profession in my organisation if I have questions about the right way to do something.	O	O	O	O	O
2	I feel comfortable checking with **doctors** in my organisation if I have questions about the right way to do something.	O	O	O	O	O
3	I feel comfortable checking with **nurses** in my organisation if I have questions about the right way to do something.	O	O	O	O	O
4	I feel comfortable checking with **allied health professionals** in my organisation if I have questions about the right way to do something.	O	O	O	O	O
5	I feel comfortable checking with **non-health professionals** (e.g. social workers, teachers) if I have questions about the right way to do something.	O	O	O	O	O
6	**Doctors** in my organisation do not fully value my skills and talents.	O	O	O	O	O
7	**Nurses** in my organisation do not fully value my skills and talents.	O	O	O	O	O
8	**Allied health professionals** in my organisation do not fully value my skills and talents.	O	O	O	O	O
9	**Non-health professionals** do not fully value my skills and talents.	O	O	O	O	O
10	I fear that if I make a mistake in my work, some members of my own professional group may hold it against me	O	O	O	O	O
11	I fear that if I make a mistake in my work, some **doctors** in my organisation may hold it against me	O	O	O	O	O
12	I fear that if I make a mistake in my work, some **nurses** in my organisation may hold it against me	O	O	O	O	O
13	I fear that if I make a mistake in my work, some **allied health professionals** in my organisation may hold it against me	O	O	O	O	O
14	I fear that if I make a mistake in my work, some **non-health professionals** may hold it against me	O	O	O	O	O
15	I feel able to bring up tough issues, such as potential safety or personnel problems, with members of my own professional occupational group in my organisation.	O	O	O	O	O
16	I feel able to bring up tough issues, such as potential safety or personnel problems, with **doctors** in my organisation.	O	O	O	O	O
17	I feel able to bring up tough issues, such as potential safety or personnel problems, with **nurses** in my organisation.	O	O	O	O	O
18	I feel able to bring up tough issues, such as potential safety or personnel problems, with **allied health professionals** in my organisation.	O	O	O	O	O
19	I feel able to bring up tough issues, such as potential safety or personnel problems, with **non-health professionals**.	O	O	O	O	O
20	I would be happy to work alongside any of the **doctors** in my organisation.	O	O	O	O	O
21	I would be happy to work alongside any of the **nurses** in my organisation.	O	O	O	O	O

22	I would be happy to work alongside any of the **allied health professionals** in my organisation	O	O	O	O	O
23	I would be happy to work alongside any of the **non-health professionals** that I am in regular working contact with.	O	O	O	O	O

The following questions are about your background.

11. What year were you born? 19 _____

12. Are you: Female ☐1 Male ☐2

13. How would you describe yourself?

White	☐1	Black-Caribbean	☐2
Black-African	☐3	Black-Other	☐4
Indian	☐5	Pakistani	☐6
Bangladeshi	☐7	Chinese	☐8
Other	☐9		

Please describe: _____

14. What occupational group do you belong to?

Allied health professional	☐1	Doctor	☐2
Nurse	☐3	Secretarial / clerical	☐4
Manager	☐5	Social worker	☐6
Other profession	☐7		
Please say which			

Thank you for your participation. For additional comments please use the space below.

If you have questions about this survey please contact:

Dr. Lou Farbus
C408 Portland Square,
University of Plymouth,
Drake Circus,
Plymouth, Devon PL4 8AA.

tel: 01752 233866
email: louise.farbus@plymouth.ac.uk

Please return the survey either directly to Lou Farbus or in the attached stamped return envelope to the above address. Thank you.

Appendix 7: Project outputs and dissemination to January 2010

Reports

- Report to CAMHS and City Council on Infant Mental Health network in Child Mental Health Network.

Conferences

- 'Towards an understanding of NHS networks: some implications of pilot research.' 1st Annual NHS Networks Conference 2006
- 'Values and Managerial Processes in Clinical Networks in England.' European Health Management Association conference, Lyon 2007.
- 'Networks as a Structural Form for the Delivery of Health Care: Evidence from the British National Health Service Three Year Study'. Public Management Research Association Conference.
- 'The resilience of healthcare networks under conditions of system reform and restructuring'. Organisational Behaviour in Health Care Conference, Sydney 2008.
- 'Management and Effectiveness of Clinical and Professional Care Networks: Lessons from England'. Anglo-Scots network conference 2009.

Papers

- Woodcock Ross, J, Hooper, L, Doris, F, Stenhouse E,. Sheaff, R. (2008) 'What are child care social workers doing in relation to infant mental health?: an exploration of professional ideologies and practice preferences in an inter-agency network' *British Journal of Social Work* Advance access doi:10.1093/bjsw/bcn029
- Sheaff R, Benson L, Farbus L, Schofield J, Mannion R, Reeves D (2010) Network resilience in the face of health system reform *Social Science and Medicine* 70 (5) 779-786.
- Stenhouse, E, Hooper, L, Doris, F, Sheaff, R. (submitted) 'A systematic review of infant mental health services: help-seeking and service access of minority and socially excluded groups'

Appendix 8 Network artefacts

Table 39. Descriptive list of network artefacts

Care-group	Children			CHD				Self-care
Site	**Child Mental Health Network**	**Children's Hospital Project Network**	**City children's Network**	**Small CHD Network**	**Regional CHD Network**	**Urban CHD Network**	**Pilot Site CHD Network**	**Self-Care Network**
Artefact								
Common protocols	•							
Map of existing care pathways	•	•		•		•		
Adaptations of central guidance to local conditions	•			•				
Children's centre	•							
Evaluations of network	•						•	•

Documentation of network remit, plans and working practices	•				•		•	
Training conferences, workshops	•	•		•	•	•	•	
Systematic review of models of care	•							
Service standards	•			•	•	•		
Plan for relocation of hospital services		•						
Geographical modelling of patient flows		•			•			
Hospital demand and capacity modelling		•			•		•	
Cost projections for member organisations		•						
Public consultation		•					•	
Redeploy community nursing services	•	•						

Nurse rotation between community and hospital care		•						
Pilot implementation of European working time directive		•						
Short breaks scheme for parents and children			•					
Joint (LA+NHS) commissioning of children's services	•		•					
New primary care angioplasty service				•	•			
Review of referrals from primary to secondary to tertiary care.		•		•	•	•	•	
Increased uptake of cardiac rehabilitation.				•	•	•		
Compare service standards against similar services				•	•		•	

elsewhere								
Service review				•	•	•		
Redesigned service pathways		•		•	•	•		
Pre-hospital thrombolysis provision				•				
Specialist heart failure nurse post				•				
Experimental patient transport to exercise classes				•				
Multi-language translations of patient support manual on heart failure				•				
Clinical guidance					•		•	
Experiment with patient-held medical record					•			

Extended role for regional specialist centres					•	•		
Experiment with diagnostic testing in primary care for heart failure					•			
Service strategy statement		•	•		•			
Cross-organisational consultant cover rotas					•	•		
Grants for 'targeted' service improvements					•			
Pilot project for heart improvement (diet and exercise) programme					•			
Regional patient transfer service (with ambulance support)					•			
Dental advice letter to pre-operative patients					•			

Database					•			
Website			•		•			
Advice and recommendations to commissioning bodies		•	•	•	•	•		•
Re-analysis of existing NHS datasets for performance monitoring					•	•		
New percutaneous coronary intervention (PCI) service						•		
Experiment with minimally invasive cardiac valve replacement						•		
Food hygiene and preparation training								•
Exercise sessions								•
Volleyball tournaments								•

Tai chi								•
Boccia								•
Walks								•
Patient trips (to coast etc.)								•
Contributions to time-bank and skill-swap schemes								•
Display at PCT-sponsored events								•
Health education / promotion materials				•	•			•
Entry to national competition for self-care projects								•
Patient survey		•						•
Art sessions								•
Cookery class								•

Recruit cardiac physiologist technicians.							•	
PBR for revascularisation							•	

Addendum

This document is an output from a research project that was commissioned by the Service Delivery and Organisation (SDO) programme whilst it was managed by the National Coordinating Centre for the Service Delivery and Organisation (NCCSDO) at the London School of Hygiene & Tropical Medicine. The NIHR SDO programme is now managed by the National Institute for Health Research Evaluations, Trials and Studies Coordinating Centre (NETSC based at the University of Southampton.

Although NETSCC, SDO has managed the project and conducted the editorial review of this document, we had no involvement in the commissioning, and therefore may not be able to comment on the background of this document. Should you have any queries please contact sdo@southampton.ac.uk.